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OPERATION MANUAL

P350 flexitrax™ system

ADVANCED CRAWLER-BASED VIDEO INSPECTION SYSTEM

90/P350-OPMAN-ENG/10 ISSUE 10 6/2014

READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING THE SYSTEM

Pearpoint®

P350 flexitrax™ system

Preface

Please read this operation manual before attempting to use the P350 flexitrax system. Note that this manual and all its contents are subject to change. Pearpoint products are under continuous development.

Pearpoint reserves the right to modify any product, including this manual, without notice and some product changes may have taken place after this user manual was published.

Contact your local Pearpoint dealer or visit www.radiodetection.com for the latest information about the P350 flexitrax product family, including all accessories, documentation and software updates.

This operational manual is for use with MK3 systems with P350 Controller software versions 4.16 and above. New functions were introduced with the MK3 systems, as well as new connectors between the controller, drum and PSU. For earlier product compatibility information, contact your local Pearpoint representative.

Before you begin – Important legal & safety notices

Please observe all safety notices and warnings in this manual before operating any Radiodetection or Pearpoint product.

Warnings, Cautions and Notes

WARNING!: Warnings alert you to possible personal injury.

CAUTION: Cautions alert you to possible equipment damage.

NOTE: Notes contain useful information.

Key to symbols used

General Warning: Refer to Manual for specific instruction or advice.

Electrical Hazard: Observe safe practices and exercize extreme caution.

Heavy object: Additional care must be taken when lifting.

Biohazard: Disinfect after use. Wear appropriate personal protective equipment (PPE).

Hot Surface: Allow to cool or use appropriate protection when handling.

Crush hazard: Keep body parts away from this area

Risk of heat generation / fire

General

Radiodetection has taken care to provide the necessary information in this manual for the safe installation, operation, maintenance and disposal of this equipment.

However, a risk assessment should be performed prior to commencing work as it may highlight additional safety issues specific to the application.

Installation

The P350 flexitrax, including its component parts is heavy. If available, use the wheels to assist transport. Observe heavy-lifting safety practices when lifting any component of this system. Refer to the specifications in the Appendix for a description of the system's dimensions and weights.

If mains operated equipment is connected to the system then the external equipment must be earthed in accordance with the manufacturer's instructions.

Failure to comply with this may cause the unit to become live and a LETHAL HAZARD.

Generator Selection

Pearpoint strongly recommends the use of generator equipment with Inverter type outputs. This results in enhanced quality of supply voltage to the P350 system over varying load conditions. To power the P350 system in isolation (in all configurations) requires an inverter output rated at 1.2kVA, additional electrical loads connected to the same generator will increase the overall required rating accordingly.

Generator equipment with AVR type outputs may be suitable for use if the minimum requirements of generator loading for AVR operation are met under all operational circumstances; this is one reason why inverter output equipment is highly recommended. The minimum load the P350 system provides can be as low as 75VA. AVR equipment operated below its minimum loading can lead to loss of voltage regulation that could cause damage to the P350 system. Additional high power loads (such as a water heater or air-conditioner) on an AVR generator can also lead to voltage fluctuations that could exceed the maximum ratings of the P350 system.

Generator equipment that does not employ voltage regulation techniques outlined above (e.g. condenser or capacitor output or synchro-converter output) must not be used with the P350 system as damage to the P350 system from unregulated voltages is likely.

If in doubt regarding generator output selection, voltage stability or installation of the generator into a vehicle, consult a qualified electrician and/or your generator supplier.

If using a generator, start the generator and let the generator to run for a few seconds before turning the P350 on. Please turn the P350 off before stopping the generator.

The flexitrax Power Supply Unit (PSU) is designed to reduce hazards from electric shock provided that proper operating procedures are followed. The P350 flexitrax system requires connection to a protective earth. It is also recommended to use a residual current circuit breaker (RCCB) that can protect against electric shock. RCCB devices are known in some countries as Ground Fault Circuit Interruptors (GFCI). The RCCB needs to be suitable for a load of 13A and a tripping sensitivity of 30mA or less.

Operation guidelines

Please observe your company, region or country's Standard Code of Practice for surveying underground utilities with CCTV equipment, if applicable, when using this equipment.

Safety precautions

Always carry out a risk assessment of the site to be inspected. This equipment is NOT approved for use in areas where hazardous gasses, liquid or solids may be present.

Foul water systems can be a source of serious biological hazards. Wear appropriate protection when handling the P350 flexitrax.

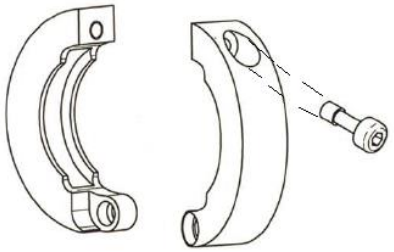
The camera will get hot during use. This is normal. Exercise care when handling the camera at all times.

System components must NOT be connected/ disconnected or connectors touched while the power is on. Ensure all connections are connected before switching on the system. Do not touch the connectors while powered on.

There are no user-serviceable internal components. The system (in particular the PSU) should not be opened by ANYONE except approved service houses with authorised training from Radiodetection on specific tasks, as these have high voltage components that could remain hazardous with the mains supply disconnected.

The external connectors of the P350 Manual PSU unit and Powered Drum are required to be properly sealed by the blanking caps provided or by using the correct leads to prevent water damage to the units. Under no circumstances are these connectors to be left un-blanked. The controller I/O panel socket has a rainproof socket flap covering the I/O socket – this must be closed at all times wet conditions are expected. In particular, large USB drives or cables may prevent this panel from closing – ensure this is closed during wet operation. The power must be switched off while the tractor/camera/lighthead/elevators are removed from the system. The system cannot be "hot plugged" which may cause damage to the system components.

CAUTION: On all downhole equipment, a modified screw is used to ensure waterproof connections to the C-Clamp securing connector. It is critically important that only our official screws are used, our C-clamp screws are modified to ensure waterproof and reliable connection. Significant damage and costs will occur if "off-the-shelf" screws are used – which will not be covered by our warranty. Example image included of the C-Clamp and screw below.



CAUTION: Take care to ensure that video and power cables do not get entangled in the drum. Cable ties are recommended and will not impede system performance. Always store the P350 flexitrax system in a clean and dry environment.

Ensure that standard safety precautions for working in hostile environments are followed.

The flexitrax Power Supply Unit (PSU) is designed to reduce hazards from electric shock provided that proper operating procedures are followed. The P350 flexitrax system requires connection to a protective earth; if in doubt, consult a qualified electrician.

Electrical equipment is factory tested for electrical safety. Routine inspection is recommended (and may be required to maintain this level of protection). If you are unsure, contact your local safety authority for advice.

The flexitrax Power Supply Unit has a number of ventilation slots around the casing that are designed to maximize air circulation and reduce heat. There is a potential fire risk if the build-up of heat is prevented from escaping. Under no circumstances are these ventilation slots to be covered or blocked.

If using a generator follow the manufacturer's instructions on load connection and sequencing. In the absence of these instructions the following guidelines should be used:

1. When starting the generator; ensure that all electrical loads, including the P350 are switched off before starting the generator. Allow the generator to stabilize before connecting any electrical loads or switching on the P350.
2. When stopping the generator; ensure all electrical loads, including the P350 are switched off before stopping the generator.
3. Starting or stopping a generator whilst the P350 system is connected and the main switch is in the On position could lead to damage to the P350 system or the generator.

Always use heavy-duty industrial gloves when handling cable which is being withdrawn from a sewer.

Always ensure that cabling is properly connected.

A portable generator can be a hazard if not properly operated. Always follow the manufacturer's instructions.

Always transport a generator with the minimum amount of fuel in the tank.

Always switch the system on and off using the main system switch.

Never lower crawlers or other heavy equipment into manholes while personnel work in the manhole.

To avoid risk of burns do not touch cameras or lightheads when they are switched on or immediately after switch off. Leave ample time for them to cool before handling.

The camera's LEDs are very powerful. Do not look directly at the LEDs or point them at other people.

Caution must be taken when conducting any pipeline or draining system inspection. Please observe all safety warnings located in the Preface and throughout this operation manual.

Before you attempt to operate the P350 flexitrax system, it is recommended that you familiarize yourself with any additional health and safety requirements that may be defined by company policy and any applicable local or national laws. Contact your company's or local government's health and safety officer for further information. Any depth estimation information resolved using the Sonde features should be considered a guide only, we cannot be held liable for inaccurate locate data.

The following safety precautions apply to the P350+ controller only, which contains a Li-Ion rechargeable battery:

CAUTION: Only use charging equipment provided by Radiodetection Ltd. The use of alterative chargers may cause a safety/fire hazard and / or reduce the life of the battery.

CAUTION: Do not tamper with, or attempt to disassemble the battery.

CAUTION: If battery failure is suspected, it may be necessary to return the entire unit to an authorized repair center for investigation and repair. Local, national or IATA transport regulations may restrict the shipment of faulty batteries. Check with your courier for restrictions and best practice guidelines. Talk to a Pearpoint sales representative for a list of authorized repair centers.

WARNING: Exposing the battery to a high temperature above 60°C (140°F) may activate safety systems and/or cause a permanent battery failure.

CAUTION: Waste Li-Ion batteries must be disposed of properly, use an approved recycling facility for electronic waste.

Contact your local Radiodetection representative for information on purchasing battery packs and chargers.

CAUTION: Waste Li-Ion batteries must be disposed of properly, use an approved recycling facility for electronic waste.

Contact your local Radiodetection representative for information on purchasing battery packs and chargers.

Where the cable moves and exits the drums there exists a crush hazard. Do not insert your body parts, allow loose clothing or permit any items into these areas.

Maintenance

Clean and sanitize the P350 flexitrax system at regular intervals, including after conducting an inspection, movement into “clean areas” and returning for a service.

Always keep all connectors covered with their protective caps when the equipment is not in use. Do not dismantle any component of this system unless directed by this operation manual. Dismantling components not specified by this manual may void the product warranty.

Pearpoint recommends that only authorized service centers carry out service of this product. Service elsewhere will void the warranty. For information regarding any service needs, please visit www.radiodetection.com or contact your local Radiodetection or Pearpoint representative or dealer. Please give consideration to “clean” work environments and hygienic shipping if returning for service.

Disposal

Do not dispose of this product in municipal waste facilities. Please check local regulations for disposal of electronic products. Radiodetection complies with the requirements of: 2002/96/EC Waste Electrical and Electronic Equipment.

Declaration of Conformity

We: **Radiodetection Limited**
Western Drive
Bristol
BS14 0AF

Declare that the products listed below satisfy the essential requirements of the following Council Directives:

- 2004/108/EC, relating to Electromagnetic Compatibility (EMC).
- 2006/95/EC, relating to Electrical Equipment within certain voltage limits (LVD).
- 1999/5/EC, Radio and Telecommunications Terminal Equipment Directive (R&TTE).

P350 'flexitrax' inspection system

Comprising modules from the following list and equipment listed in the technical file.

Part Number	Description
10/P350-CMOD3*	P350 Command Module
10/P350-DRUM3-P-***	100-305m Powered drum.
10/P350-DRUM3-M-***	100-305m Manual drum
10/P350-PSU3-M	Manual drum PSU
10/P354 **10/P356**	4" (100mm) Crawler 6" (150mm) Crawler
10/P350-CAM-FW-* **10/P350-CAM-PT-*** **10/P350-CAM-PTZ-***	Forward View Camera Pan Tilt Camera Pan Tilt Zoom Camera
10/P350-PENDANT	Pendant Controller
10/P350-LH-8	8W Lighthead

The following standards have been used in the evaluation.

EN 61010-1:2010	Safety requirements for electrical equipment for measurement control and laboratory use.
EN 61326-1:2013	Electrical equipment for measurement, control and laboratory use.
EN 301 489-17 V2.1.1 (2009-05)	EMC compatibility and Radio spectrum Matters (ERM).

A Technical Construction File has been drawn up to demonstrate compliance with the essential requirements of these Directives and is kept at the above address

Signed

Date: September 2014

Darren Hill

Engineering Director

Radiodetection Ltd

CERTIFICATE No: TD-2008-001-04

Compliance & Legal statements

EU Compliance

This equipment complies with the following EU Directives.

- Low Voltage Directive
- Machinery Directive
- EMC Directive
- R&TTE Directive

FCC Compliance Statement

This equipment complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- The equipment may not cause harmful interference.
- The equipment must accept any interference received, including interference that may cause undesired operation.

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause harmful interference with radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case you will be required to correct the interference at your own expense.

Modifications: Any modifications made to this equipment that are not approved by Radiodetection may void the authority granted to the user by the FCC to operate this equipment.

Industry Canada compliance statements

ICES-003 Class A Notice:

This Class A digital apparatus complies with Canadian ICES-003.

Avis NMB-003, Classe A:

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Bluetooth transmitter

Contains Transmitter Module FCC ID: PI409B / IC: 1931B-BISMPA33.

Disclaimer

Any third-party products (including hardware, software and services) mentioned in this manual are for instructional purposes only and are not an endorsement by Radiodetection Ltd, Pearpoint and SPX Corporation.

Radiodetection Ltd does not accept any liability for loss of data or damage to equipment when using any third-party products.

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Training

Radiodetection provides training services for most Pearpoint products. Our qualified instructors will train equipment operators or other personnel at your preferred location or at Radiodetection facilities. Training is recommended to ensure system capabilities and operation is maximized and to encourage best and safe working practices. Depending on time required and distance travelled there may be negotiable costs.

For more information go to www.radiodetection.com or contact your local Pearpoint representative.

About this manual

This manual provides comprehensive operating instructions for the P350 flexitrax™ pipeline video inspection system. Before attempting to operate the P350 flexitrax system it is very important that you read this manual, noting all safety warnings and procedures in the Preface, Section 1.3 and throughout the rest of the manual.

Once you have read this manual, it is recommended that you retain it for reference purposes. A printed version of this manual is available on request. Please contact your local Pearpoint representative for more information. The rest of the manual is detailed as follows.
Section 1: Includes annotated illustrations of the command module, powered and manual drums and selected accessories.

Section 2: Provides a detailed guide to assembling the system ready for conducting inspections.

Section 3: Provides a comprehensive introduction to using and configuring the command module and various system settings.

Section 4: Introduces the basics of pipeline inspections and describes how to deploy and drive the crawler, create video recordings and control the camera during an inspection.

Section 5: Introduces the concepts of how to create reports.

Section 6: Introduces how to review your work through the browser windows.

Section 7: Introduces the files browser and general operations.

Section 8: Provides a comprehensive guide to digital video options and settings. Section 8 also includes a guide to converting and distributing videos for playback on computers and other video equipment.

Appendix: Includes reference and other important information as well as instructions on caring for and maintaining your P350 system.

Overview

The P350 flexitrax is an advanced pipeline video inspection system that is ideal for a broad range of applications. This system allows operators to identify and document pipeline faults using the latest in digital video recording technology.

The P350 flexitrax is a fully modular system; the command module can drive any combination of drums, cameras and crawlers and is also compatible with the P330+ and P340 flexiprobe™ range of pushrod reels and cameras. System components can be purchased as individual components or whole functional systems. Speak to your Pearpoint representative to ensure you have all the necessary parts to make a working system.

Latest Software updates and information

Pearpoint may have released new system software, user documentation or other information after you purchased your system.
You can download the latest software, documentation and application notes from www.radiodetection.com. For more information about checking and upgrading your system's software, please refer to section System Maintenance.

Software versions 4.X and above have a number of crucial differences from the earlier Version 2.X software. This can considerably effect operator use. A guide to the main differences are provided below:

- New simpler user interface and menus. This may cause a delay to the operator while the team get used to the new menu structure.
- The new menu systems remove the requirement to select the **DRIVE** mode before the survey begins.
- The removal of the **RETRIEVE** drum function, to encourage user-controlled safe return of the system.
- Record video and images directly onto USB memory devices.
- Gamepad controller compatibility.
- **JOBS Manager** to review and edit surveys present on your Compact Flash or USB media. The JOBS Manager allows the user to save the media in dedicated customer folders, improving data management and allowing superior integration with FlexiSight Manager.
- Automated software manager to simplify software updates.

- Control your P350 system using compatible third party reporting software, via Ethernet connected PCs.
- **TILT protection** warning to prevent tractors from tipping over, activated at 35°.
- Added FlexiSight Manager pitch profile mapping
- MK3 systems introduced enhanced cable connectors

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Section 1 - Introduction to the system

1.1 Command module

The command module acts as the controller, digital video recorder and viewer. Video is displayed on an 8" industrial LCD. Video, pictures and inspection reports are stored on a compatible high-speed Compact Flash card, or USB memory drive.

1. On/Off Switch (only works when powered from the DC input on the front panel).

2. Keypad and function keys: Allows the operator to control the system, select functions and edit text entries.

3. Keyboard: Enter text and use shortcuts to access system features.

4. LCD Display: Shows video, images and various system information.

5. Link Cable Socket: Connect the pushrod reel, powered drum or manual external PSU to the command module with a link cable.

6. Command module support clamp: Mount the command module onto the drum support column, or to the optional vehicle wall mounting kit.

7. Fuse holder: 5x20mm T3.15A 250V cartridge fuse.

8. RCA Video Jacks: Provide extra input and output options (for external composite video connection).

9. DC Power Socket: DC power input from vehicle supply, battery box or mains adapter.

10. Compact Flash card slot: Compact Flash memory card option to store video recordings, reports and pictures. Also used to store and upload software upgrades.

11. Keyboard Socket: Connects the keyboard.

12. Audio Socket: Connects the optional headset to record audio over videos via the microphone.

13. USB-A socket: USB memory card option to store video recordings, reports and pictures. Also used to store and upload software. Can also be used to connect the Gamepad controller.

14. Internal battery power port and charger (P350+ only). used to supply power to the controller, or charge the internal battery.

15. PC socket. USB (type B) connection to transfer files to computers.

16. Ethernet port, for connection with third-party survey reporting tools.

31. Battery status indicator (P350+ only): Displays estimated internal battery level.

32. Battery Check button (P350+ only): Activates the battery status indicator.

Keypad

17. Function keys: Use to select menu items or activate shortcuts.

18. Camera key: Take pictures of current screen.

19. Text key: Access Text and Report menu.

20. Play: Enter the card browser menu or start video playback of selected file.

21. Pause: Pause video or recording.

22. Record: Begin a new video recording.

23. Stop: Stop video playback or recording.

24. Crawler stop: Stops the crawler moving.

25. Arrow keys: Use for navigation and to select system parameters.

26. OK: Press to select or confirm choices in

the menu system.

27. LED Brightness/Camera Focus keys: Adjust LED brightness and camera focus. Fn + brightness key to adjust camera focus.
28. Rotate/Pan keys: Rotate the camera view. Fn + Rotate to pan left or right. Pressing simultaneously resets to the center.
29. Zoom/Iris keys: Press to zoom in or out of the camera's subject.
    Press Fn + Zoom to modify the Iris. Simultaneous press will reset the zoom to unity, Fn + simultaneous press will reset to automatic iris.
30. Function key (Fn): Press and hold to activate different functions.

Figure 1.1: Command module

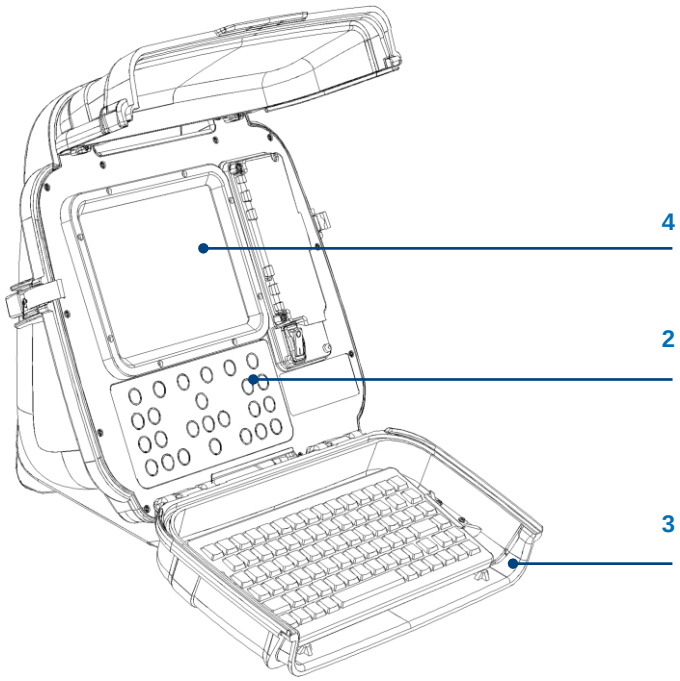


Figure 1.2: Command module rear view

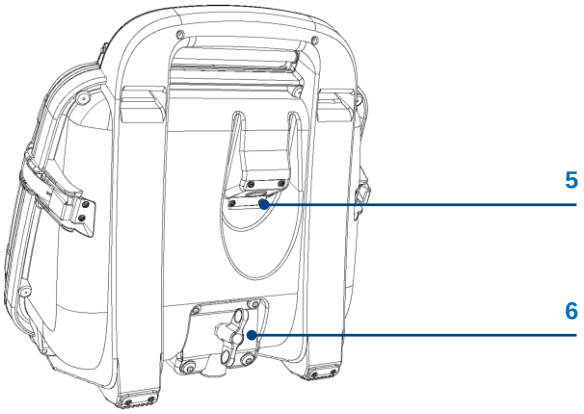


Figure 1.3: Command module I/O panel

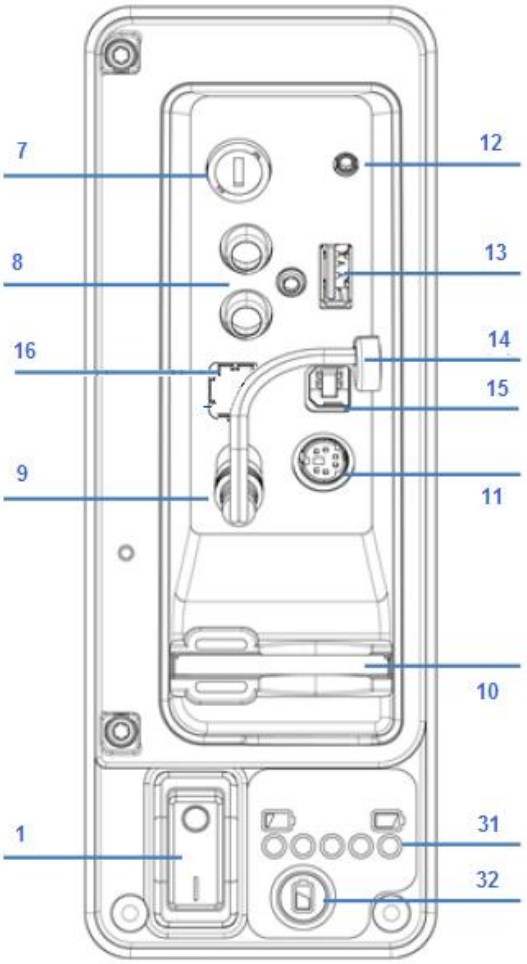
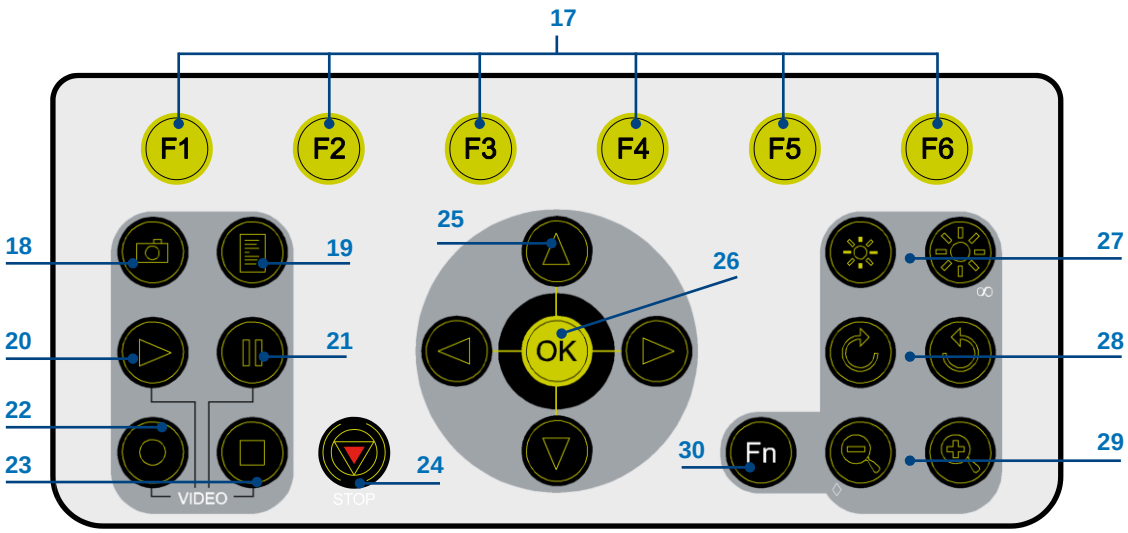


Figure 1.4: Command module keypad



1.2 Cable drums

The system supports either a powered or manual drum that can accommodate cable lengths of 100m (330'), 150m (495'), 200m (660'), 250m (820') and 305m (1000'). The powered drum contains an integral power supply whilst the manual drum requires an external power supply unit.

The cable drum cassette in the powered drum is user-replaceable. Refer to the Appendix for instructions on how to remove and install the cable drum cassette.

Optional lengths of cable are also available for both the powered and manual drums.

Please visit www.radiodetection.com for a complete list of spares and accessories.

Powered drum

1. Command module support stand.
2. ON/OFF switch. Switches the system ON or OFF.
3. Command module.
4. Cable compartment.
5. Removable handle, handle bars and wheels: Allows simpler movement of the drum.
6. Emergency stop: Instantly shuts off system power. When pressed, the system must be fully reset to continue (if safe to do so).

6b. Pushrod reel connector (software selectable pushrod/crawler operation).

7. Pendant connector: For connecting the optional pendant controller.
8. Command module connector: To connect the command module link cable.
9. LED On/Off power status indicator lights
10. Power supply socket: To connect mains power.
11. Fuse holder (5x20mm, T12A 250V cartridge fuse).
12. Crank handle: Will allow the manual winding of deployed cable. (Not shown).
13. Optional vehicle mounting rails: To secure the system in your van. (Not shown).
14. Cable rollers

Manual drum

15. Cable drum.
16. Cable brake.
17. Crawler connection terminal (Not shown).
18. Crank handle socket.
19. Command module support clamp.
20. PSU link cable socket.
21. Manual layering handle: To assist with laying cable evenly on the drum.
22. Cable rollers.

Manual Drum External PSU

2. On/Off switch.
6. Emergency stop: Instantly shuts off system power. When pressed, the PSU must be fully reset to continue (if safe to do so).

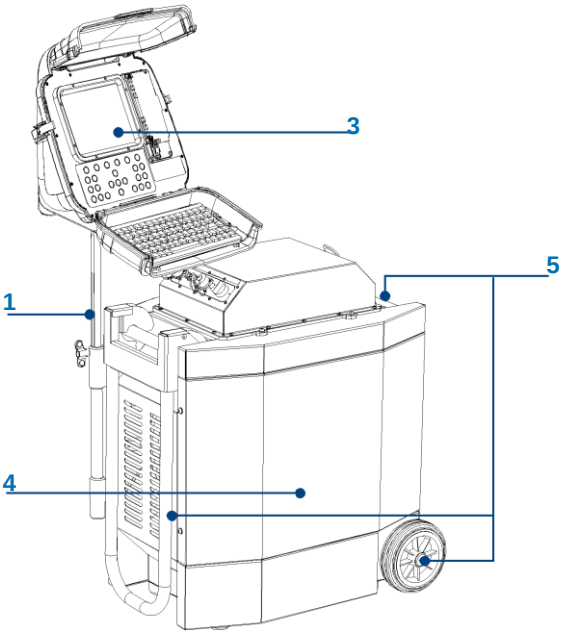
6b. Pendant connector: To connect the optional pendant controller.

7. Pushrod reel connector (P340).
8. Command module connector: To connect the command module link cable.
10. Power supply socket: To connect mains power.
11. Fuse holder: 5x20mm T12A 250V cartridge fuse.
23. Link cable connection for manual drum.

Link cables

24. Command module link cable.
25. Manual drum link cable.

Figure 1.5: Powered drum with command module installed



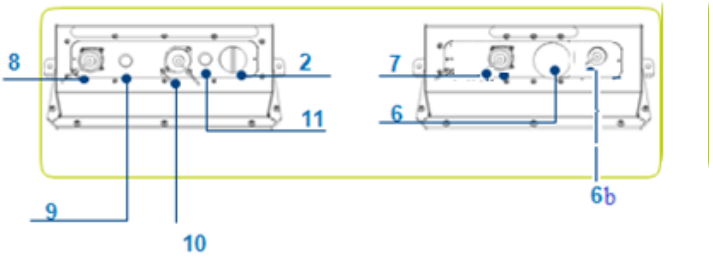


Figure 1.7: Front and rear connection panels (Common to powered drum and external PSU)

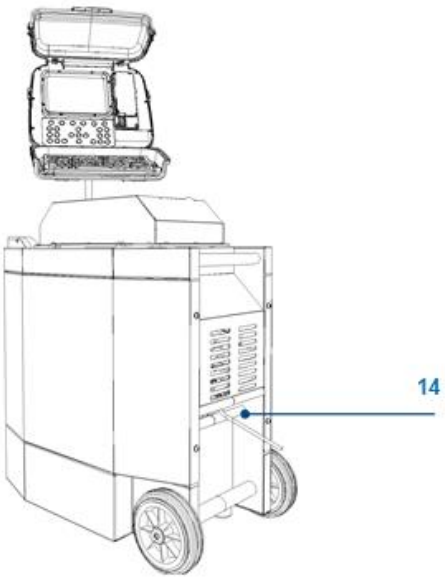
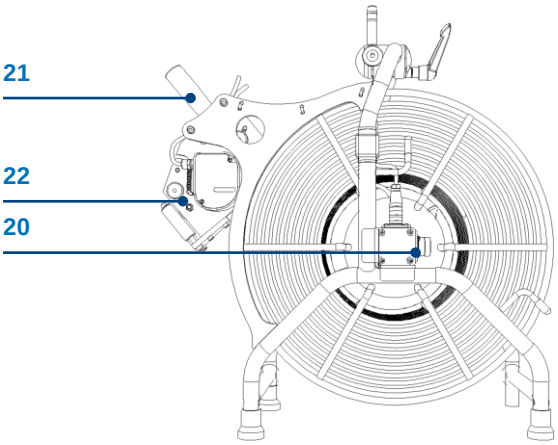


Figure 1.6: Manual drum



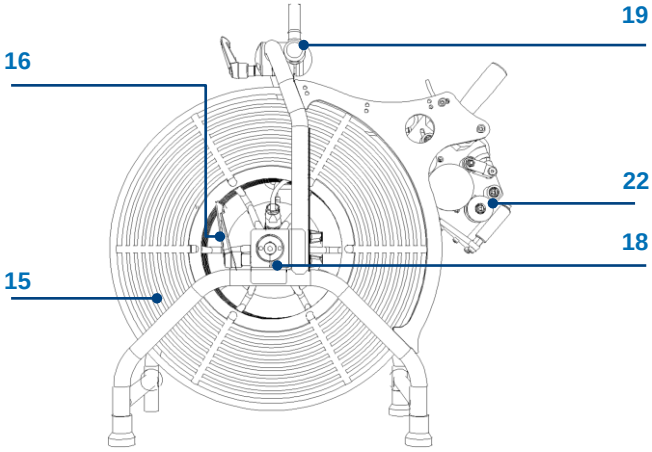


Figure 1.8: External PSU

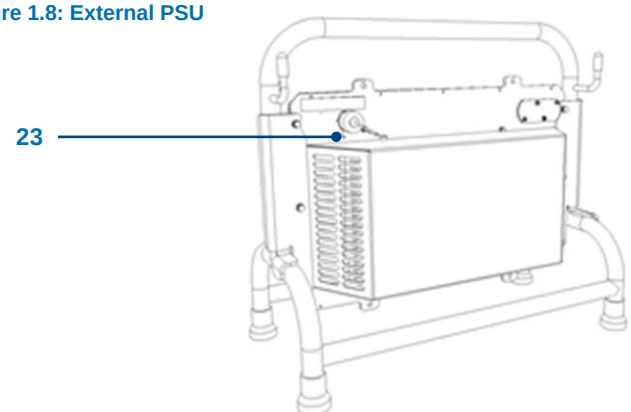


Figure 1.9: Link cables

1.3 Crawlers and Cameras

The system offers two crawlers: the P354 (100mm/4”) and P356 (150mm/6”). Both crawlers are fully compatible with three cameras. The P350-CAM-FW is a fixed, forward view camera. The P350-CAM-PT offers pan and tilt and the P350-CAM-PTZ offers pan, tilt and 10x optical zoom.

P350 systems offer automatic TILT protection. This will halt the crawler in hazardous tilting situations, when its roll first exceeds 35°. The user will be shown a tilt hazard warning, but can restart the crawler movement if necessary.

Figure 1.10: P354 crawler with P350-CAM-FW camera installed installed

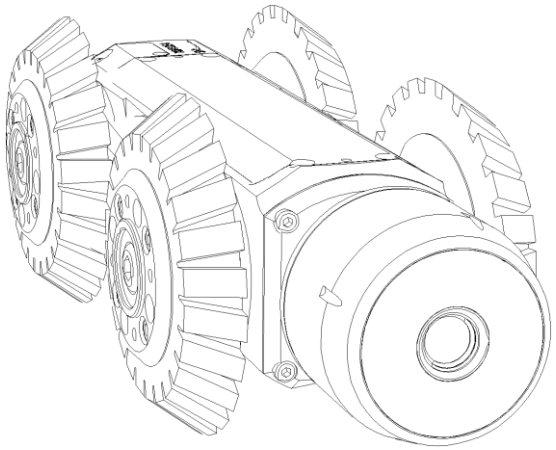
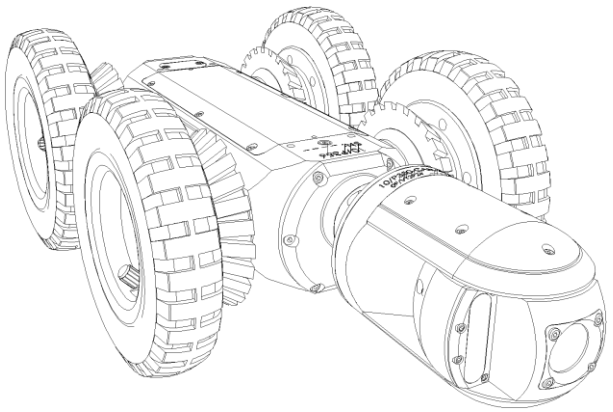


Figure 1.11: P356 crawler with P350-CAM-PTZ camera installed



1.4 Pushrod reels and cameras

The command module is compatible with the full range of P330+ and P340 flexiprobe pushrod systems. The pushrod can be directly connected to the command module, or to the PSU.

In the **MENU > SETUP > EQUIPMENT** section, pushrod mode is selected in the below menu. The system will auto-detect whether the pushrod is connected directly or to the drum PSU. This also effects counter accuracy and video quality.

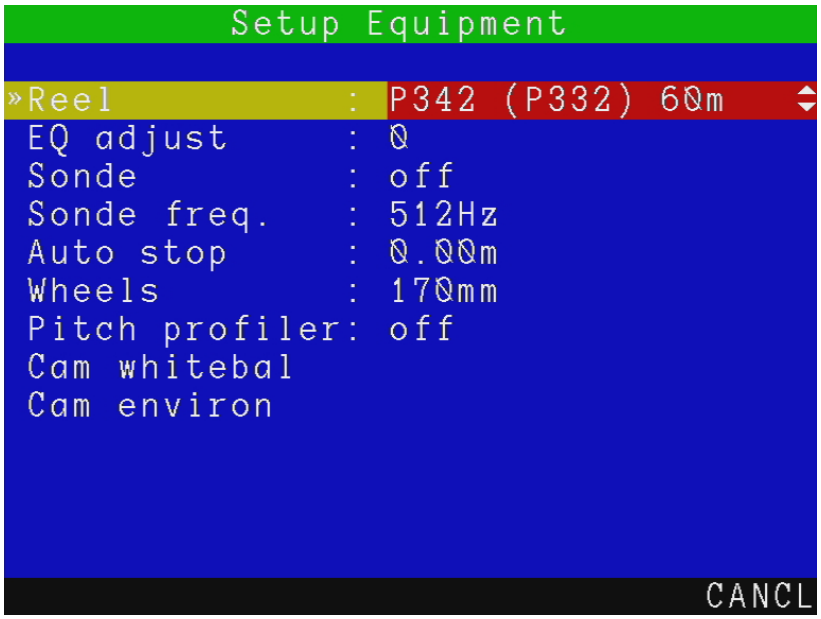


Figure 1.11a – Pushrod

For information on assembling and using a pushrod system, refer to the P330+ and P340 flexiprobe user documentation available on the FlexiSight Manager installation CD or at www.radiodetection.com.

Please note that a P340 Command module cannot control a P350 crawler system.

1.5 Accessories

The P350 flexitrax system features a range of accessories that will be discussed throughout this manual.

1.6 Optional - Internal Rechargeable Battery

The P350+ Controller with optional internal battery allows the controller to be used as a Pushrod controller for up to 5 hours, depending on usage and system configuration, or to review P350 surveys while detached from the system. It cannot power the crawler system due to the high-power requirements of these components.

To charge the internal battery, connect either:

- The mains battery charger, see figure 1.12 (left), connected to your mains electricity source.
- The automotive charger, for use with car vehicles sockets.

You can also connect the automotive charger to the desktop AC/DC power supply to be able to charge from mains.

The first time you charge this battery, you should allow at least 6 hours to fully charge it. When fully charged the status indicator will light up as a solid green (with no flashing).

To use the battery, connect the battery power lead to the controller power input as shown (Figure 1.12, right) below.

CAUTION: Keep the power connector clean and dry at all times. Cover the power lead connector on the box when it is not in use.

The charging temperature of the internal battery is 0° to 45°C.

WARNING! Use only the supplied mains battery charger or the optional automotive charger. Do not plug any other Pearpoint connectors into the Li-Ion charger socket. Protect the charger against high relative-humidity and water. Do not attempt to open the charger. Do not use the charger for charging other batteries. Failure to comply will damage the charger.

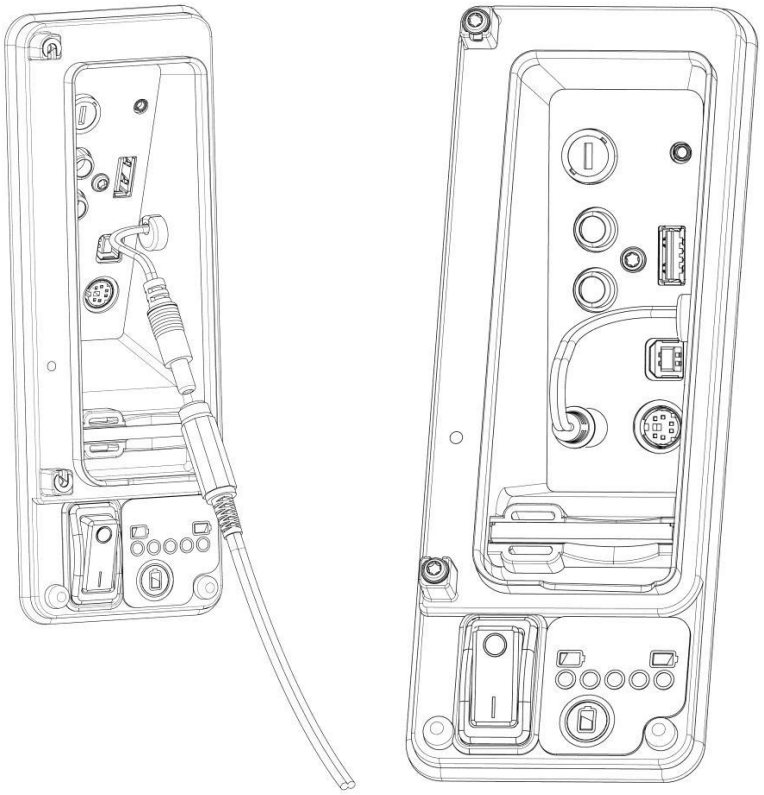


Figure 1.12 Charging the internal battery (left). Using the internal battery to power the controller (right)

The P350+ flexiprobe battery contains Li-Ion cells. Follow local and national regulations for the correct handling of battery cells. Including environmental and shipping considerations.

To check the charge status of the internal battery, press the battery check button and the status lights above will display in 5 increments the estimated charge status.

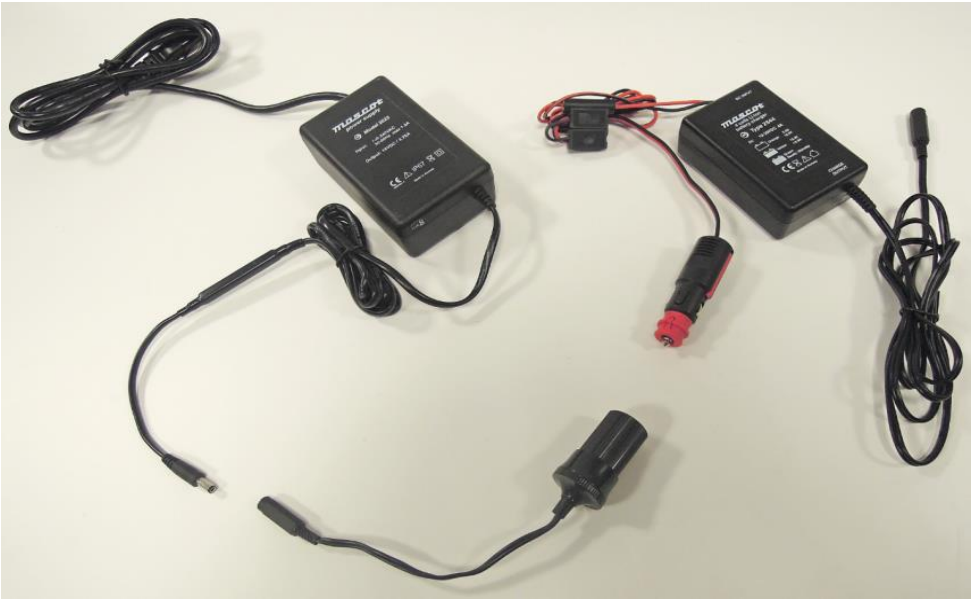


Figure 1.13 Connecting the mains power lead to the automotive charger with the use of the cable adaptor.

CAUTION: We recommend the use of an alternative power source when batteries are low, due to the risk of losing survey information. A low battery may also cause the power to cycle repeatedly.

1.7 “Gamepad” USB Controls

A console-type gamepad controller.

The USB slot can be used to either store media and survey information, or connected to our approved Gamepad controller. Providing console-like control and performance in a convenient and cheap package.

CAUTION: Please note it is not waterproof and should not be used outside while wet weather is expected.

The controls are proportional and ‘direct drive’, i.e. if the operator pushes the crawler joystick 50% forward it will drive at roughly 50% speed, or 100% forward at 100% speed forward, and vice versa. The crawler will stop when it is left in the centre position. Please see the below diagram of mapped functions.

CAUTION: We do not support 3rd party untested and unapproved Gamepads which may produce unexpected operation when used with our software. As such any damage or losses incurred while using other gamepads will not be covered by any warranties.

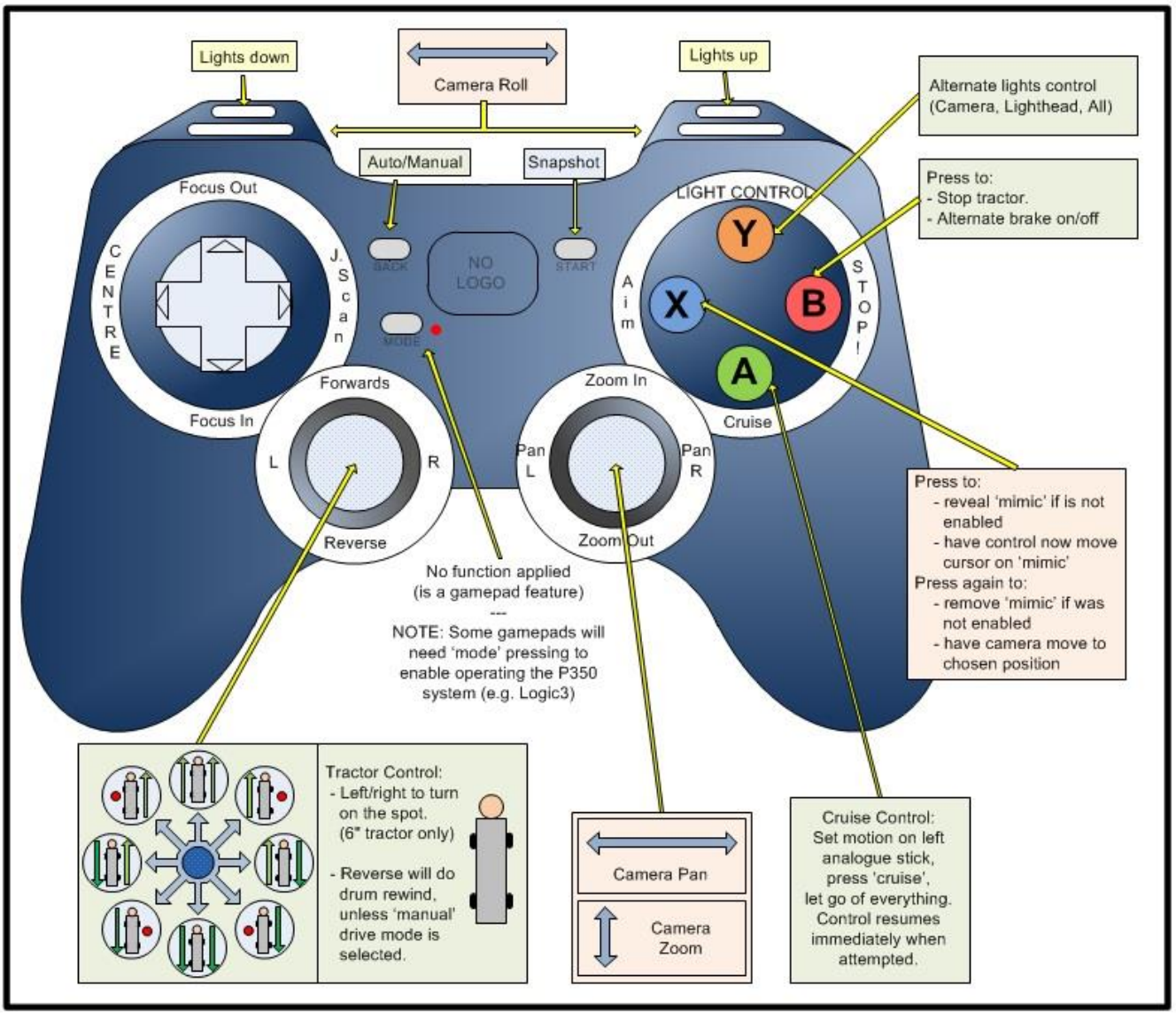


Fig 1.14 Gamepad controller function map

NOTE: these devices typically calibrate themselves every time they are powered up. If the joysticks appear off-centre or behaving erratically, cycle the power to reset the calibration routine.

Section 2 - System assembly

The system can be setup in a large number of ways, depending on your survey requirements. This section provides details on system assembly. You will as a minimum require an Allen key set and a range of general purpose screwdrivers.

⚠ WARNING!: If using a generator, ensure that this is compatible with the P350 system. Refer to the Generator Selection paragraph in the preface of this document for further information

⚠ WARNING!: Before attempting to assemble the system, ensure that the power is switched off

⚠ WARNING!:Check that all the link cables are connected as per instructions.

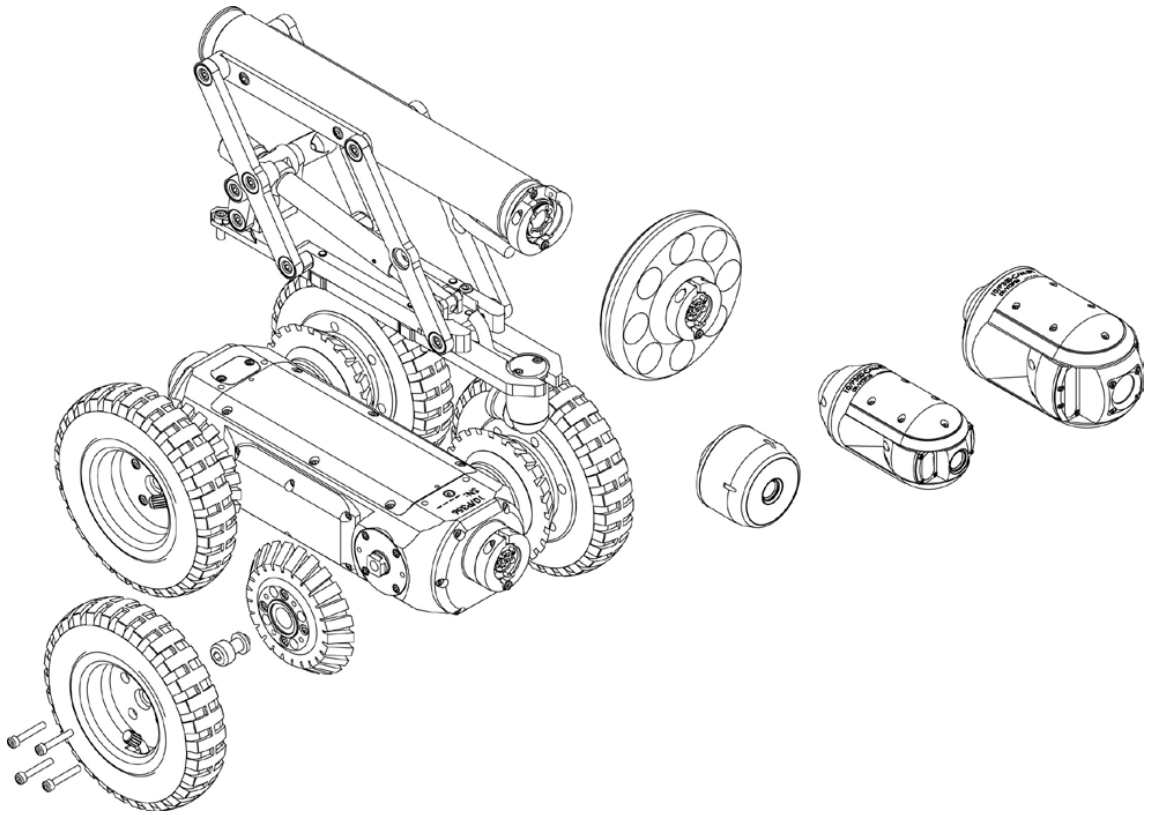
⚠ CAUTION: Do not replace the C-Clamp modified screws (at rear of tractors and cameras) with standard 'off the shelf' screws, as these have not been designed to secure connection.

2.1 Crawler, Camera and accessories

The P354 and P356 crawlers have a variety of wheels, tires, cameras and accessories to suit your survey. The figure below demonstrates some of the options available.

⚠ It is necessary to match the appropriate wheel-set connected in the MENU > SETUP > EQUIPMENT > WHEELS menu, incorrect wheel settings will cause motor strain, incorrect behaviors and early life failure on the crawlers.

Figure 2.1: P356 crawler assembly



Crawler weight (P354 Only)

The crawler weight is a metal plate designed to increase traction by adding more weight to the crawler. Attach the weight on the crawler body before attaching other wheels and accessories, then secure with the provided screws

Wheels and tires

The P354 uses the small and medium wheel sets. These can also be ‘doubled-up’ to improve traction in larger pipes. It’s recommended range is between 4” and 15” (60mm to 305mm). The small wheels are 62mm / 2.5” diameter and the medium wheels are 110mm / 4.3” diameter.

The P356 uses small, medium and large wheels, which can also be ‘doubled-up’ to improve traction. This allows it’s use between 6” and 24” (150mm and 610mm). Above this size you may have issues with lighting, view or driving ability. The small and medium wheels come with hard or soft tire material options to suit different grip requirements. The large wheels are 170mm / 6.7” in diameter.

NOTE: although it will work electrically and mechanically, we do not recommend a PTZ camera on a P354 Crawler due to the large camera size.

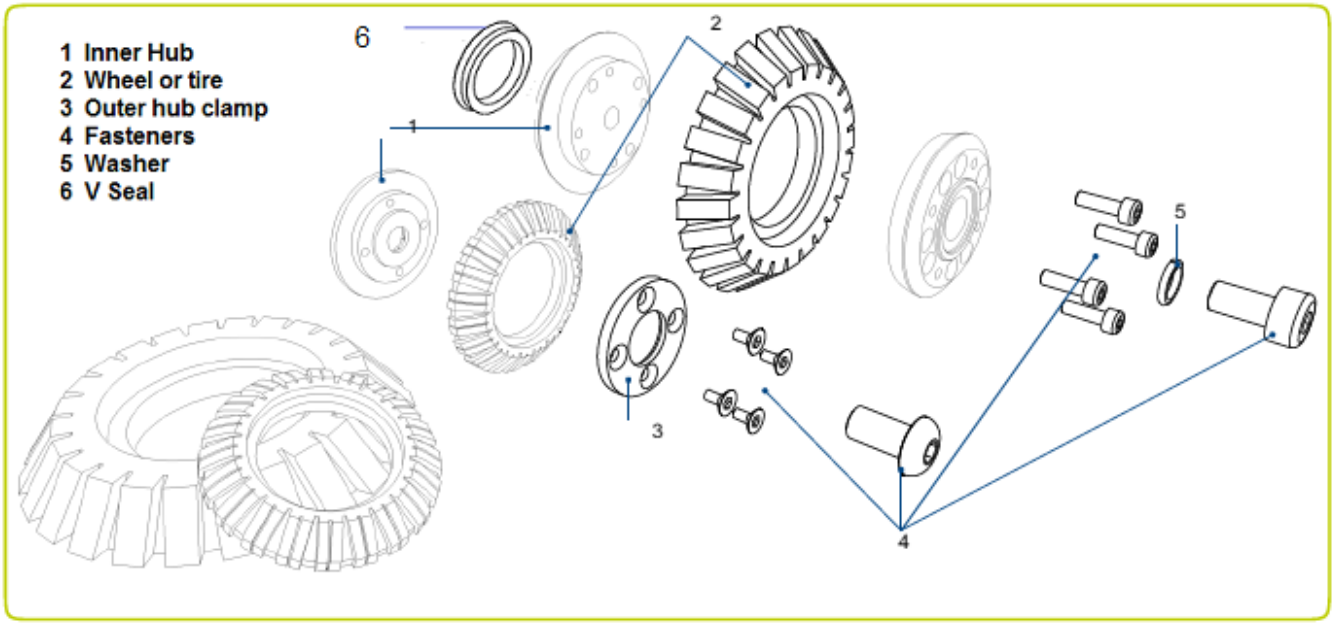
Connecting wheels and tires

Figure 2.2 demonstrates how to attach wheels and tires to the P354 and P356 crawlers (62mm and 110mm only).

The inner hub is located on the crawler’s body. Place the wheel on the inner hub and secure in place using the outer hub clamp.

NOTE: Ensure the wheel screws fit firmly to the crawler.

Figure 2.2: Connecting various tires (top) and the abrasive wheels (below)



NOTE: Item 6 “V-seals” prevent debris ingress into the crawler seals on the medium and large wheel sets. It is beneficial to check and replace these at regular intervals or ask our service teams to do so. 4x part 04/B1525510

2.2 Specialist Wheels

Abrasive (rasp) wheels

The abrasive wheel kits have been designed to enhance grip, boosting the distance and capability of your P350 flexitrax system in a wide-range of applications. Particularly recommended for brand new plastic, greasy, or 'relined' pipes where grip with standard rubber wheels can be challenging.

These are available in 5 kits with suitable adaptors for pipe size (6", 8" and 9" pipes). See the spare part kits in the appendix for details. The small abrasive rasp wheels should use the 62mm wheel size setting, while the large abrasive rasp wheels should use the 110mm wheel size setting

10/P354-6R-S-ABR-KIT	P354 Abrasive Kit - 6" pipe kit (Small wheel)
10/P354-8R-M-ABR-KIT	P354 Abrasive Kit - 8" pipe kit (Medium wheel)
10/P354-9R-M-ABR-KIT	P354 Abrasive Kit - 9" pipe kit (Medium wheel)
10/P356-8R-M-ABR-KIT	P356 Abrasive Kit - 8" pipe kit (Medium wheel)
10/P356-9R-M-ABR-KIT	P356 Abrasive Kit - 9" pipe kit (Medium wheel)

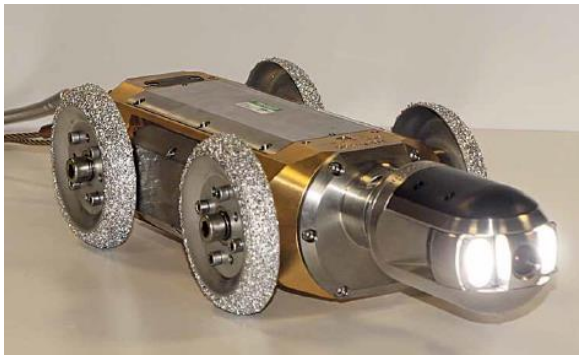


Figure 2.2a Abrasive wheels in action

84mm 'Slim Profile' Wheels

84mm wheels improve performance in areas where the pipe diameter decreases, typically joint offsets and areas with reasonable debris buildup. The slimmer profile of the unit allows a greater chance of passing through these tight areas. Adaptors are required to attach these wheels to the P350 and these wheels are also compatible with the P238 tractor series.

Part Number: 10/P350-84MM-WHEELS-M-KIT

Figure 2.2b Kit of 84mm wheels

⚠ CAUTION, when using the 84mm wheels with the 84mm wheel adaptor, select 84mm size wheels in the MENU > EQUIPMENT >WHEELS area. Failure to do so may cause stress to the tractor motors and cause early life failure. Please note these wheels also require controller software 4.8 or above to be able to select appropriate wheel sizes.

Double-large wheel adaptors & configuration

Comprised of 2 full sets of P356 Large wheels (8x) and (4x) adaptors, allowing the large wheels to be mounted in a tandem configuration. Designed to increase surface area and grip helping to navigate silted culverts and pipes.

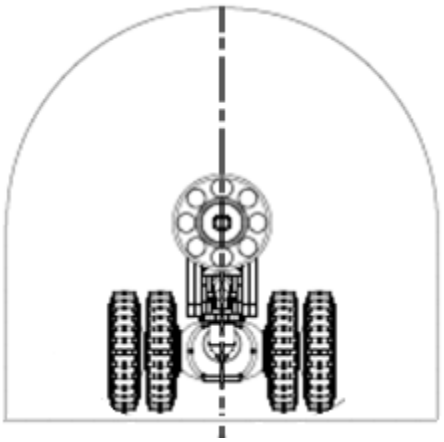
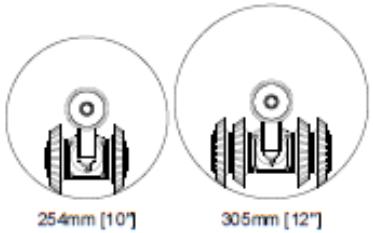


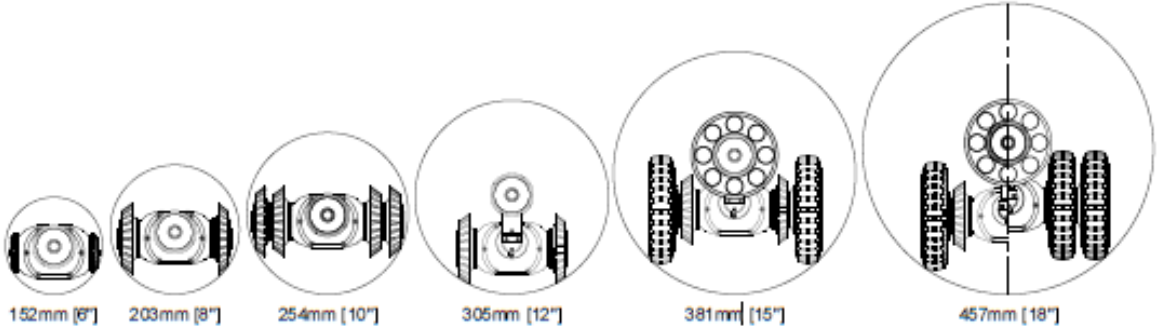
Figure 2.2c An illustration of the P356 with the ‘double-large-wheel’ configuration enabled for added surface area and grip

Part Number: 10/P350-DUAL-WHEEL-KIT

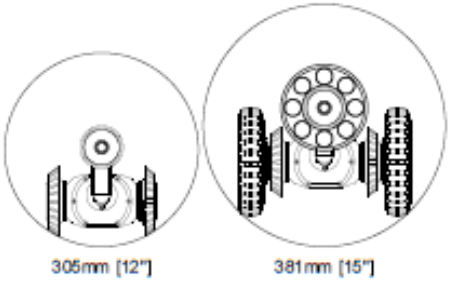
P354 CRAWLER (ADJUSTABLE ELEVATOR) CONFIGURATIONS
(100mm [4"] - 305mm [12"] PIPE)



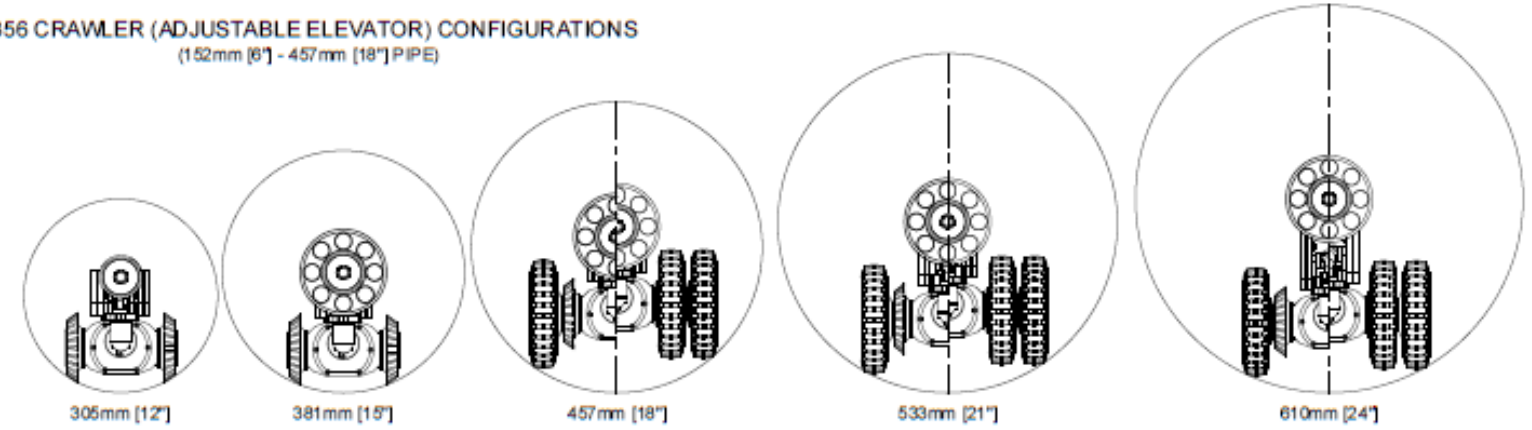
P354 CRAWLER (FIXED ELEVATOR) CONFIGURATIONS
(254mm [10"] - 305 [12"] PIPE)



P356 CRAWLER (ADJUSTABLE ELEVATOR) CONFIGURATIONS
(152mm [6"] - 457mm [18"] PIPE)



P356 CRAWLER (FIXED ELEVATOR) CONFIGURATIONS
(305mm [12"] - 381mm [15"] PIPE)



P356 CRAWLER (LARGE ADJUSTABLE ELEVATOR) CONFIGURATIONS
(305mm [12"] - 610mm [24"] PIPE)

Note: The PTZ camera is not recommend for the P354 due to size and weight issues.

1-GROOVE ADAPTOR

2-GROOVE ADAPATOR

3-GROOVE ADAPTOR

4-GROOVE ADAPTOR

5-GROOVE ADAPTOR

SMALL RASP WHEEL

LARGE RASP WHEEL

152mm [6"] - Nominal
135mm [5.3"] - Minimum
(using 3-Groove adaptor)

203mm [8"] - Nominal
189mm [7.5"] - Minimum
(using 4-Groove adaptor)

229mm [9"] - Nominal
215mm [8.5"] - Minimum
(using 5-Groove adaptor)

P354 CRAWLER RASP WHEEL CONFIGURATIONS
(152mm [6"] - 229mm [9"] PIPE)

203mm [8"] - Nominal
189mm [7.5"] - Minimum
(using 1-Groove adaptor)

229mm [9"] - Nominal
215mm [8.5"] - Minimum
(using 2-Groove adaptor)

P356 CRAWLER RASP WHEEL CONFIGURATIONS
(203mm [8"] - 229mm [9"] PIPE)

Cameras

The P354 and P356 have three high- resolution cameras, with PAL or NTSC versions available.

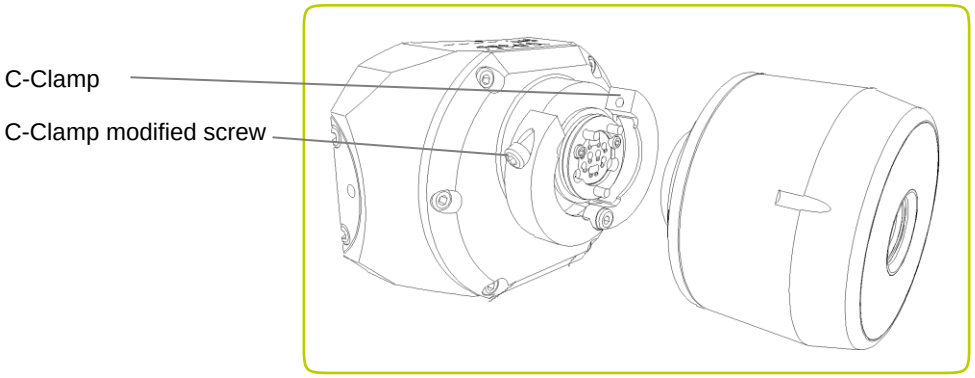
All cameras offer remote focus capabilities and use the latest ultra-bright LEDs for optimum lighting.

Cameras can be fitted direct to the crawler's body (or to an elevator or lighthead). The cameras can only be fitted in one alignment. A single 3mm Allen key screw is used to secure the camera to the crawler.

Connecting cameras

Figure 2.4 illustrates the connection of cameras using the C-clamp connection. The procedure is the same for all three cameras.

Figure 2.4: Connecting a fixed view camera



Cameras:

Figure 2.5: Fixed view camera

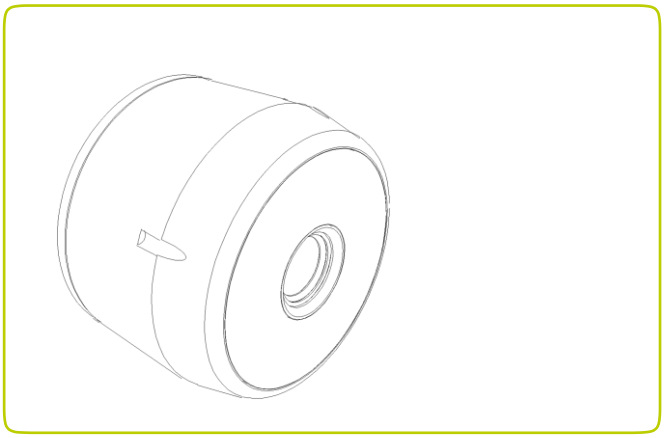


Figure 2.6 Pan & Tilt Camera

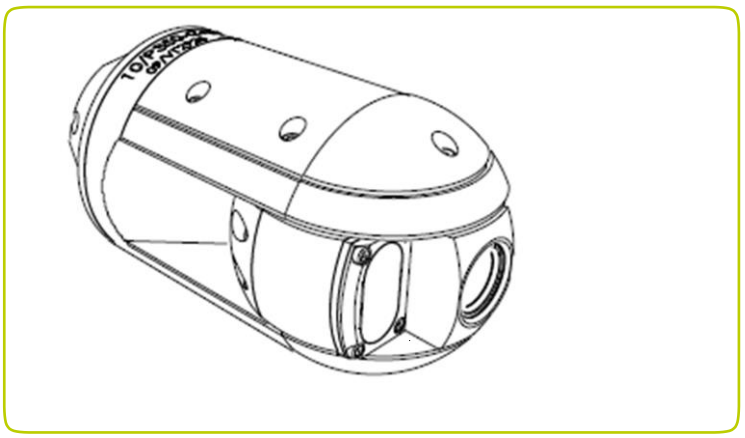
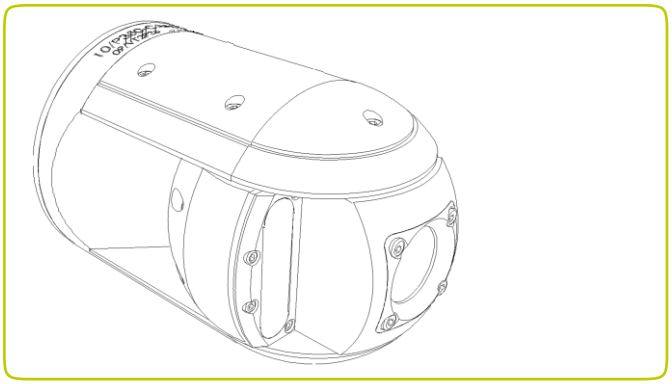


Figure 2.7 Pan, Tilt & Zoom Camera



Fixed View camera

P350-CAM-FW: this robust and compact camera offers a focal range from 10mm to infinity and a 120 lm light source.

Pan and Tilt cameras

The Pan and Tilt camera allows clear vision of pipes. With focal range from 10mm to infinity; featuring a 210 lm light source.

Pan, Tilt and Zoom cameras

P350-CAM-PTZ camera also includes auto-focus, 10x optical zoom with a focal range of 10mm (WIDE) to infinity, featuring a 420 lm light source.

Elevator

The P350 elevators are used to elevate the camera and help center it in pipes 254mm (10”) in diameter or larger.

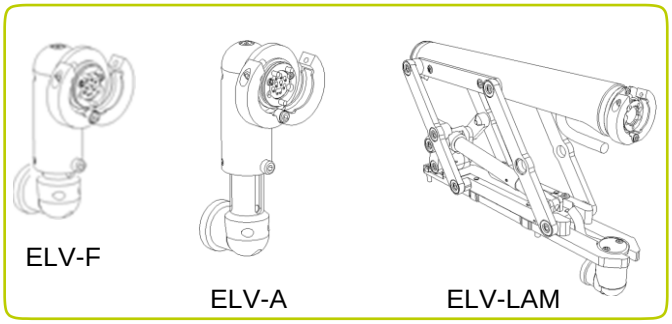
The P350 system offers a choice of 3 elevators:

• Fixed elevator. The fixed elevator will deploy the P354 in pipes up to 300mm (12") and the P356 in pipes up to 380mm (15”).

• Adjustable elevator. The adjustable elevator will deploy the P354 in pipes up to 350mm (15") and the P356 in pipes up to 458mm (18").

• Large adjustable elevator (For the P356 only).The large adjustable elevator will deploy the P356 in pipes from 300mm (12”) up to 610mm (24").

Figure 2.8: P350 camera elevators

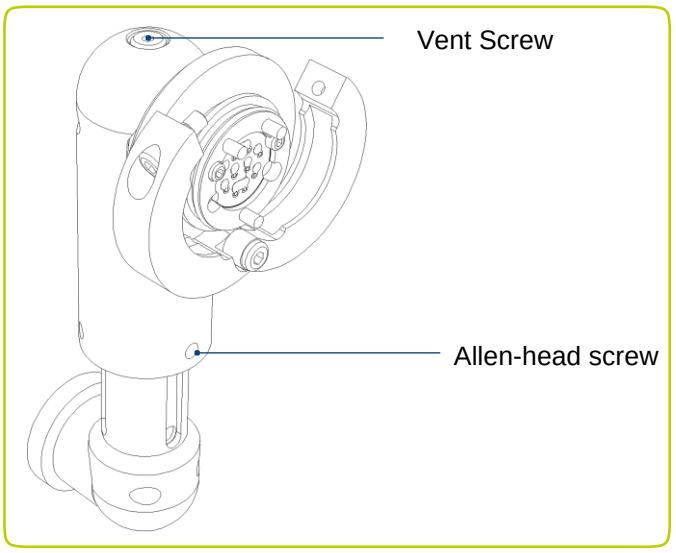


Adjustable elevator

To adjust the Adjustable elevator:

1. Loosen the Allen-head and the vent screws
2. Set the camera mount to the desired height.
3. Tighten the Allen-head and the vent screws to secure the elevator.

Figure 2.9: Adjustable elevator



Large adjustable elevator

To fit the large adjustable elevator to the P356 crawler, align the four mounting holes and secure it using the four screws provided. This is demonstrated in Figure 2.10.

To adjust the elevator twist the square- recessed socket, the supplied chuck key varies the height as required. This is demonstrated in Figure 2.11.

Figure 2.11: Adjusting the large adjustable elevator

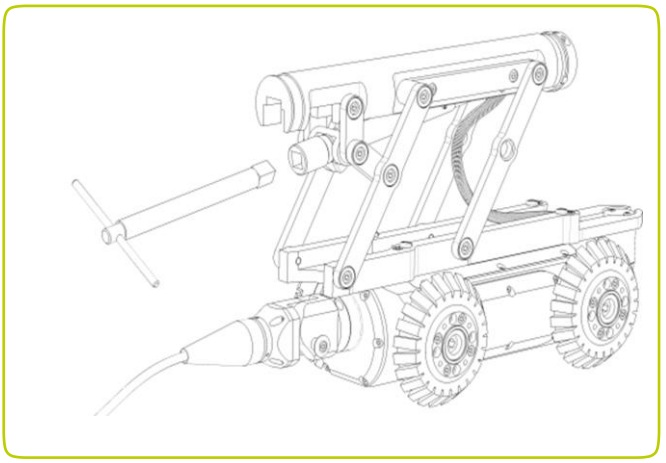
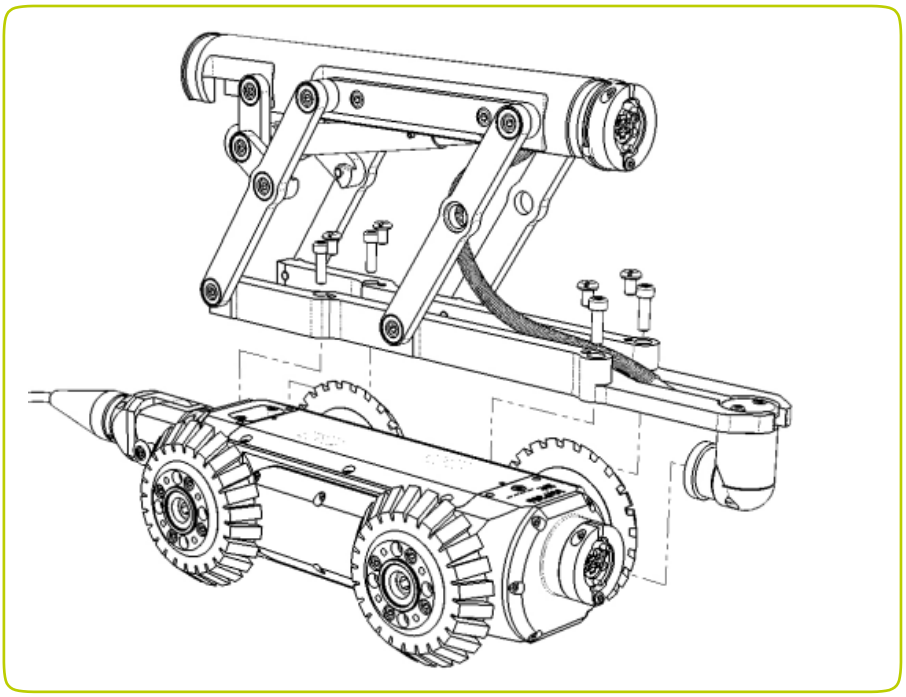


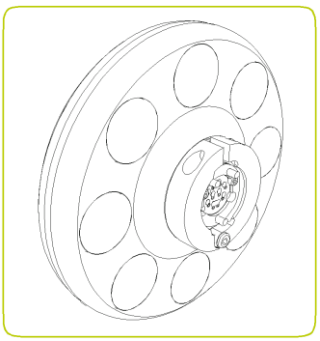
Figure 2.10: Installing the large adjustable elevator



The Auxiliary Lighthead

This can be used to offer additional LEDs to provide the camera with more light. With more light you can deploy the crawler in larger pipes or in pipes made from light-absorbent material that would otherwise reduce visibility. The lighthead is fitted between the camera and the crawler or between the camera and the elevator. The lighthead provides up to an additional 850 lm.

Figure 2.12: Auxiliary lighthead



Crawler connection

Once you have fitted the crawler with the cameras, wheels and other accessories, you can connect it to the cable drum.

Connect the crawler cable termination to the terminal on the back of the crawler's body; use a 3mm Allen key to tighten the cable termination's C-clamp.

Cable strain relief and spring guard

The cable connecting the crawler to the drum features a strain relief assembly and a stainless steel spring guard. The spring guard helps to protect the cable end against damage to the cable sheath.

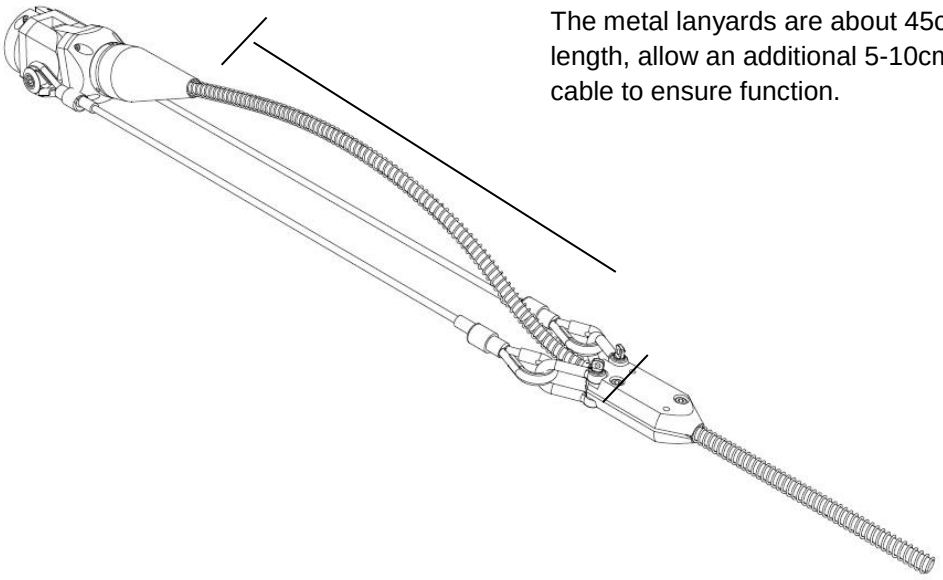
Figure 2.13 illustrates the strain relief clamp and spring guard.

Ensure that there is sufficient slack on the cable when the lanyards are taut.

Ensure the D-shackle retention pin's heads are pointing upwards.

⚠CAUTION: Never use the system without the strain relief properly assembled. Failure will damage the termination and may result in the crawler being disconnected from the cable

Figure 2.13: Strain relief clamp and spring guard



Crawler deployment tools

The crawler deployment grab tools for the P354 and P356 crawlers are optional accessories that allow an operator to safely deploy and remove a crawler into manholes, culverts and other access points. The grab tool can deploy and remove the crawler in conduits up to five meters (16.5 feet)* deep. Using the crawler grab tool is highly recommended.

*Using all four of the supplied guide rods. Deployment depth is limited to the length of the Bowden cable.

⚠CAUTION! The rods are not designed to bear the weight of the crawlers and all attached accessories. Use durable rope (not supplied) to lower and remove the crawler. Choose high-quality rope that is certified to hold at least 50kg /110lb (for P354 crawlers) or 100kg/220lb (for P356 crawlers).

Refer to Section 4.2 Crawler Deployment for a guide to crawler deployment. As well as Section 4.9 - Removal of crawler from ducts, for a guide to crawler removal using the deployment tools.

2.3 Manual drum & External PSU

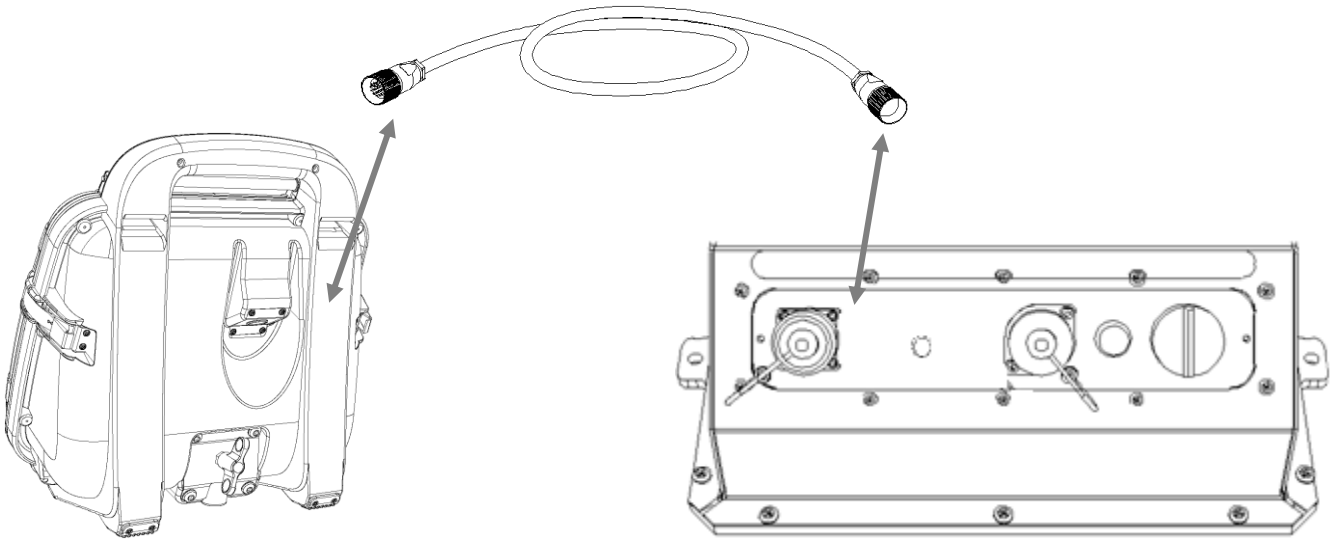
The external PSU connects to the manual drum using the link cable. The single end connects to the manual drum and the split end terminals connect to the manual drum connection panel on the rear side of the PSU's handle.

MK3 connectors are not compatible with MK1 and MK2 sockets. Contact service for the latest compatibility options.

⚠WARNING: The external connectors are required to be properly sealed by the blanking caps provided, or by using the correct leads to prevent water damage. Under no circumstances are these connectors to be left un-blanked.

2.4 PSU Connection

Figure 2.15 PSU to Controller connection



The PSU to power lead connector is not shown.

NOTE: The Powered drum is capable of winding in deployed cable.

⚠ WARNING: The external connectors of the Powered Drum are required to be properly sealed by the blanking caps provided or by using the correct leads to prevent water damage (and related to the unit. Under no circumstances are these connectors to be left un-blanked.

2.5 Command module

Mounting

Mount the command module to the drums using the support column or stand. The height can be adjusted on the powered drum support column. See figure 1.5 item 1.

Power, data and video

When using the manual or powered drum, a single link cable supplies the command module with power, data and video. The link cable socket is located on the back of the controller. See figures 1.2 and 1.7.

Mount the controller and connect the controller cable to the controller terminal on the powered drum or external PSU.

Keyboard

The supplied keyboard is connected via the PS/2 connector in the I/O panel.

NOTE: Only the supplied keyboard is compatible with the command module.

Headset

The optional headset allows you to record and hear audio commentary in your video recordings. Connect the headset to the audio socket in the I/O panel. See figure 1.3.

Compact Flash card

Insert a Pearpoint approved high-speed Compact Flash card into the card slot, which is located inside the I/O panel (Item 10 in Figure 1.3).

CAUTION: Please note the orientation of the card before attempting to insert it into the controller. Although a groove on the card will prevent you from inserting the card the wrong way, forcing this will damage the Compact Flash card socket.

For more information about Compact Flash cards, contact RD_Support@spx.com or your Pearpoint representative.

If the card does not support high-speed video recording, you will receive an error message when pressing the record button, please contact your local Pearpoint representative for options.

USB flash drive

Insert a high-speed Pearpoint USB flash drive, (commonly known as a memory stick or thumb drive) into the USB socket, which is located inside the I/O panel (Item 13 in Figure 1.3).

If both a CF card and a USB flash drive are present, the controller will use the USB flash drive for recording.

If the memory device does not support high-speed video recording, you will receive an error message when pressing the record button, it may also crash the controller – remove the disk, use a compatible card or contact your local Pearpoint representative for options. It is also vital to use the Pearpoint USB drive because if the device is physically large it will prevent the rainproof seal from closing – which will lead to water ingress and expensive repairs.

2.6 External video equipment

You can connect a range of video equipment to the system using the video jacks on the command module. This can include video recording and playback equipment or external monitors.

These devices are connected using standard composite video cable with RCA or BNC-type connectors as appropriate (not supplied).

⚠WARNING! Connected equipment must be earthed according the equipment manufacturer's documentation. Failure to comply may result in electric shock and damage to the flexitrax system.

Section 3 - Command module & system setup

The command module acts as the main control unit and digital video processor for the system. It is compatible with both drums, the external PSU and the Pearpoint range of P330, P330+ and P340 flexiprobe pushrod systems.

The 8" LCD displays the on-screen system menu, live video or stored media files. You can control the command module using the keypad or the keyboard; this manual will detail using both methods where applicable.

In addition to playback and control, the command module can be connected to external video equipment to personal computers using the USB-B or the RJ45 sockets and to compatible *Bluetooth*® devices.

3.1 Powering up

When the system is correctly assembled, switch it on using the On/Off switch on the powered drum or external PSU.
NOTE: The command module takes approximately 10 seconds to display the first screen.

Depending on the settings, the command module will display one or two short intro screens, followed by the welcome screen. The welcome screen displays important system information; press **OK** to continue.

⚠CAUTION: When you power off the system, wait at least 5 seconds before switching it on again. Failure to do so may cause the system to lock up.

NOTE: When the command module is switched ON with no camera signal detected, the screen will display vertical color bars.

NOTE: If the Emergency Stop button is used at any time to shut down the system, the PSU must be reset by rotating the Emergency Stop button with the main switch set to OFF.

3.2 Welcome screen

The welcome screen is the first screen to appear after the SPX logo and the optional intro screen. It provides important system status and settings information. The welcome screen is illustrated in Figure 3.1.

At start up the P350 system will automatically check the components' software for compatibility and or problems.

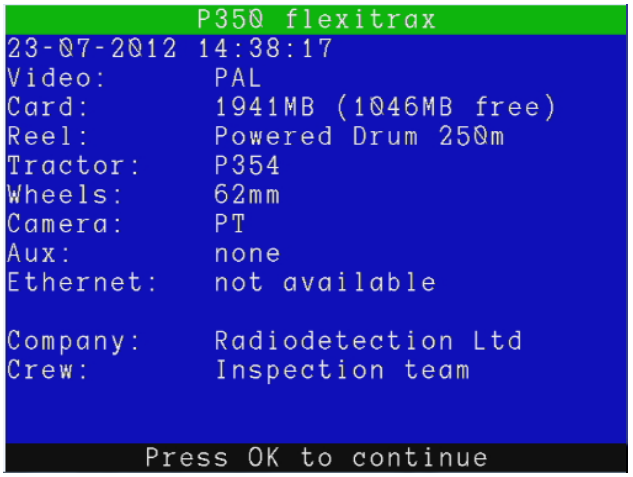
If a valid application is missing on any of the components as a result of a failed upload, a warning message will be displayed recommending a software upgrade. Subsequently a "no application" warning will be shown.
If the software loaded on a component is incompatible with the rest of the system a warning message will be displayed recommending a software upgrade.

When a software "mismatch" or a "no application" on a component is reported, you may require a software upgrade. Although the system may still function perfectly adequately and is only reporting a potential problem.

Figure 3.1: Welcome Screen

The welcome screen includes the following information:

- Video mode (PAL or NTSC)
- Memory card/drive size and free space.
- Reel or drum type / length
- Crawler Type: P354 or P356.
- Wheel Size.
- Camera Type: FW, PT or PTZ.
- Company (see Section Company Details Settings)
- Crew (see Section Company Details Settings).



If your wheel size, drum size or type is incorrect, it is important to change this. This may cause poor video quality and / or inaccurate counter measurements, as well as imbalanced drum/tractor speeds which may damage the Downhole equipment. See the Section on changing system settings.

3.3 On-screen display (OSD)

The OSD gives real-time system information on the display; it can change depending on system mode and display settings. The OSD displays the following information and graphics, see Figure 3.2:

- Mode: **ROD**, **MAN** or **AUTO**. In **ROD** mode the command module is set to work with a compatible pushrod system (the tractor will NOT work). In **AUTO** mode the drum automatically manages the cable when the crawler moves. In manual mode the Tractor drives unassisted and the drum does not recall the cable. **AUTO** is considered standard.

- Status: Crawler and Drum status. **T** is displayed if a crawler is present, B if the brake is engaged, **M** or **P** denotes a manual **(M)** or powered **(P)** system.

- Time and Date

- DVR: indicates video recording, video or image playback status.

- Distance counter: crawler distance from last reset point (in feet or meters). Press **F10** to reset the distance to 0.0.

- Page: the currently selected text page (if any).

- Pitch: An inclinometer displays the crawler angle in degrees, or as a gradient percentage.

- Mimic: Crawler driving speed (also steering information when used with a P356). Also provides pan and tilt controls when a pan and tilt camera is connected.

- System menu: to access menu.

The Time, Date, Counter, Pitch and Mimic information is stored on any recorded video (depending on chosen settings).

You can add, edit, move and change the OSD using the Settings menu. See Section: 5.3 Controller Settings.

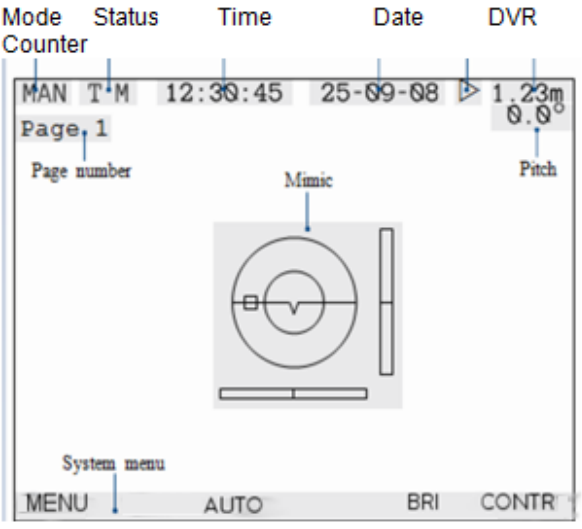


Figure 3.2 On-Screen Display

3.4 Menu layout & navigation

The menu provides access to all features and settings.

Figure 3.3: Main OSD screen

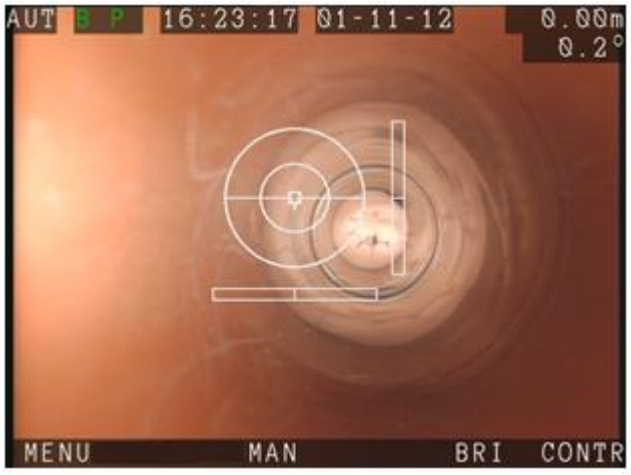
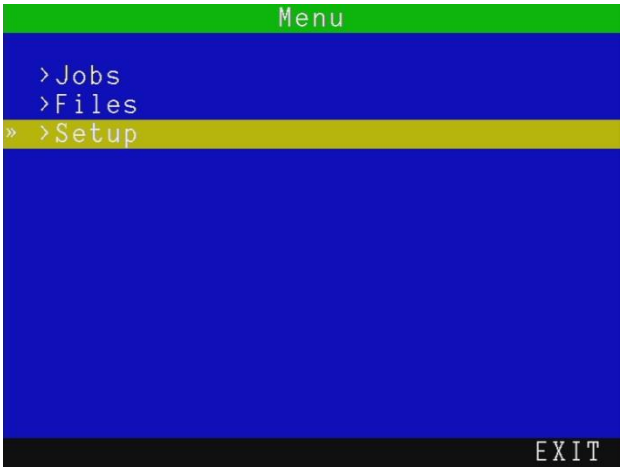


Figure 3.4 The general menu window



General navigation

From the main OSD screen above,

- **F1** enters the general menu.
- **F3** switches between **MAN** and **AUTO** drum mode. Current mode is displayed on the top left.
- **F5** and **F6** control the **BRIGHTNESS** and **CONTRAST**. Press the left or right arrows to adjust the setting slider and **OK** or **ENTER** to save.

The P350 software is based on the Main OSD screen and a number of general menu screen from which you will be able to setup and customize the P350 flexitrax system

To navigate the main OSD screen use the function keys on the keyboard or keypad.
To navigate other screens use the up and down (▲ and ▼) arrow keys to scroll up and down through the menu.

Press **OK** or the ► key to enter a submenu or to make a choice (where required)..

Press the ◄ arrow to return to the previous screen.

If the menu disappears, the on-screen timeout might be enabled; press any function key to bring it back. Check the controller settings section for further details on this feature.

NOTE: You can also use the keyboard ENTER, ESC, Function and arrow keys to navigate and select options in the menu.

Entering text with the keyboard

In text windows, you can enter any available character and use navigation keys such as Home, End and the arrow keys to position the cursor.

1. To delete all text to the left of the cursor, select **DEL <.**
2. To delete all text to the right of the cursor, select **DEL >.**
3. Press **Esc** to undo your changes and exit.
4. Press **Enter** to save your changes.

Entering text with the keypad

If required, you can enter text with the keypad arrows, although the keyboard is far more convenient.

1. Use the ▲ or ▼ arrows to cycle through the list of available characters.
2. Use the ◄ or ► and arrows to move the cursor backwards and forwards along the line.
3. To toggle between upper and lower case press **CAPS.**
4. To delete all text to left of the cursor, select **DEL<.**
5. To delete all text to the right of the cursor, select **DEL>.**
6. Press **CANCL** to undo your changes and exit.
7. Press **OK** to save your changes

Menu layout and feature map

Figure 3.5 Menu feature map

MENU				
-	JOBS			Job Browser Window
-	FILES			File Browser Window. View and edit files.
-	SETUP			Set up Menu
	-	CONTROLLER		
			- Basic Settings	Time, date, date format, language, imperial or metric, color scheme, menu time-out, video source, Job prompt, pitch units and font size.
			- Communications	Bluetooth and Ethernet / network settings
			- Recording	Change file name structure, Video title setup and Video quality.
	-	EQUIPMENT		
			- Reel	Select Drum size, Reel type and cable length. Affects accurate counter measurement and video quality.
			- EQ Adjust	To manually adjust the Video Equalizer, use this feature to search for more suitable settings.
			- Sonde	Activate Sonde
			- Sonde	Change Sonde Frequency
			- Auto-Stop	Set auto-stop distance.
			- Wheels	Select the correct wheel size used, inaccurate counter measurement will occur if set incorrectly.
			- Cam whitebal	Adjust camera white balance
			- Cam environ	Select PIPE or SURFACE mode.
			- Pitch Profiler	On or OFF
	-	ON-SCREEN INFORMATION		
			- Scheme	Set Display size (some monitors use different ratios, similar to widescreen or 4:3)
			- Time	Enable / disable on-screen time text
			- Date	Enable / disable on-screen date text
			- Pitch	Enable / disable on-screen Pitch text
			- Mimic	Enable / disable on-screen Mimic text
			- Mimic Color	Change the Mimic color
			- Mimic Position	Change the Mimic position

		-	Text backg transp	Change the background transparency of the main menu bar
		-	Text color	Change the color of the main menu bar text
	-	COMPANY DETAILS		Company details can be edited here, including adding a company logo.
	-	MAINTENANCE		
		-	Update system software	Update system software from memory card
		-	Status information	Hardware and software information. Useful for service queries.
		-	View logs	Displays activity logs for system components. Can help advanced users troubleshoot and diagnose problems.
		-	Tractor Power	Turns off power to the crawler.
		-	Calibrate tractor numeric pitch	Calibration routine for the pitch profiler.
		-	Restore factory settings	Restores all factory default settings
		-	Format card	Format your Compact Flash memory card.
		-	Format USB	Format your USB memory card.
		-	System Customization	

3.5 Controller Settings

MENU > SETUP > CONTROLLER

3.5.1 Basic Settings

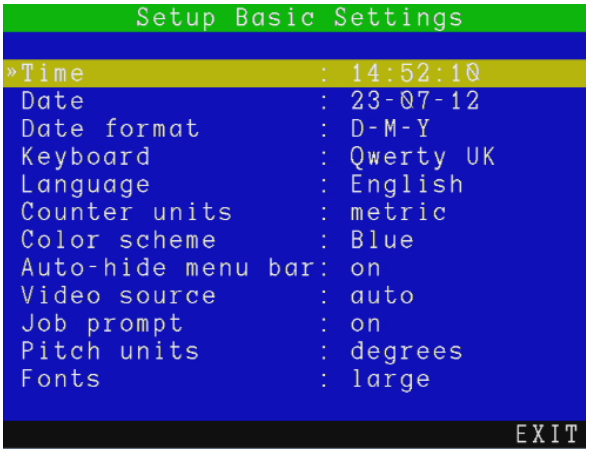
Select the setting you wish to vary and press **OK** or **Enter** to modify.

Enter the required data or make a selection by using the ▲ or ▼ keys.

Press **OK** to confirm your choice or press the ◄ key to cancel.

There are 10 basic settings you can modify:

Figure 3.6: Basic Settings menu



- **Time:** enter the time in hh:mm:ss format. Use the up and down arrows to change and the left/ right arrows to move sideways.
- **Date:** enter today's date as specified by the Date format.
- **Date format:** choose between D-M-Y and M-D-Y.
- **Keyboard:** select your keyboard type / language.
- **Language:** select the system language.
- **Counter Units:** chose between metric and imperial.
- **Color scheme:** select your preferred color scheme.
- **Auto-hide menu bar:** if "ON", the menu bar will disappear after 20 seconds. Press any key to make it visible.
- **Video Source:** set the video source for display and recording.

  There are 3 choices: Auto, Camera and External:

  - **Auto** gives preference to the external video source (if present).
  - **Camera** selects the P350 camera as the default video source.
  - **External** selects the external video source. You can connect an external video source to the controller using standard composite RCA. The controller's video input jack is located inside the I/O interface panel and is highlighted with a yellow ring around the jack.

- **Job prompt:** When **ON** the controller asks for Client, Site and Survey information during your first recording. This will set the **JOB** for all your recordings during the session, until you power down. If the prompt is **OFF**, you will go to the Quick Job Start and it will not ask you for this information, but will not save the files in convenient folders. Refer to section 4.4 Figure 4.8 and Section 6.1 for more information.

- **Pitch units**: Select degrees or gradients as units for the inclinometer displayed on the screen.

- **Fonts**: Default mode is '**large**', some customers may find the '**small**' fonts more convenient.

3.5.2 Communications (Bluetooth and Ethernet)

MENU > SETUP > CONTROLLER > COMMUNICATIONS>BLUETOOTH

The P350 controller contains a Bluetooth module that allows users to transfer files wirelessly to any compatible device, such as a computer or mobile phone.

Figure 3.7: Bluetooth menu

BLUETOOTH MENU
SCAN: Scan for nearby devices
KNOWN: Scan for paired devices
[LEFT] to return to previous menu
SCAN
Select SCAN to see a list of nearby available devices.
Repeat this step if necessary and ensure target bluetooth device is enabled and visible.
SCAN KNOWN

Press **SCAN (F1)** to search for nearby compatible Bluetooth devices. Press **KNOWN (F2)** to locate previously paired devices quickly. Follow the on-screen instructions.

NOTE: Your device needs to support the Bluetooth Generic Object Exchange (or OBEX) profile. Be aware that some devices only support the Headset (HSP) or Hands-Free (HFP) Profile. Apple devices and Motorola devices are known to not natively support the OBEX format and are not compatible with the P350 controller.

NOTE: Your computer must have an integrated or USB Bluetooth module to receive files from the command module.

You can pair the command module to most compatible Bluetooth devices, including computers, cell or mobile phones and PDAs.

Pairing

Before attempting to pair, make sure your device's Bluetooth interface is switched on and set to visible or discoverable. Consult your device's documentation if you need help to configure your device's Bluetooth setting.

Compatible Bluetooth devices can be paired to the command module. However, pairing is not necessary to transfer a file. Pairing allows the command module to discover and connect to your device quickly in an environment where many Bluetooth devices are present.

To pair your device:

1. **MENU > SETUP > CONTROLLER > COMMUNICATIONS > BLUETOOTH**
   (or initiate a file transfer using **SEND,** see Section
   General operations).

2. Press **SCAN** to search for any nearby visible devices.

3. If your device is shown, select it using the ▲ and ▼ arrows and press **PAIR**. Press **SCAN** if you cannot see your device.

4. You device will prompt you to enter a pass key. Enter '**12345**' and press **Enter or OK**, depending on your device's input (i.e. keyboard or keypad).

5. The system will display a status message. Press **OK** to return to the Bluetooth menu.

The command module and your device are now paired.

NOTE: If you cannot see your device in the list after repeated search attempts, check your corresponding Bluetooth module is on and set to visible (or discoverable). It will need to be within 10m (30 feet) of the command module*. Refer to your device's manual for more information on Bluetooth pairing.

*10m is the maximum range for Bluetooth connections. If you are near a Wi-Fi base station or in an area with a large electromagnetic field, your connection range may be reduced to less than 3 meters.

To delete a Paired device:

1. Press **KNOWN** to search for nearby paired devices.

2. Press **SCAN** if you cannot see your device.

3. Select the device you wish to remove from your paired list and press **DEL.**

4. Press ◄ to return to the Bluetooth menu.

Transferring files

You can transfer files to any visible or paired device.

1. Use the file browser to select a file to transfer by pressing **SEND**

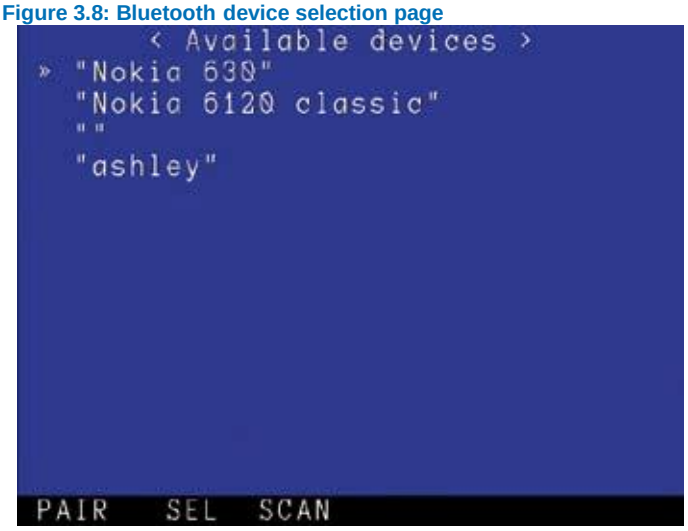
2. Select **SCAN** to locate any nearby visible devices. You can pair your device at this point.

3. Alternatively, select **KNOWN** to locate any nearby paired devices.

4. If you device is listed, select it and press **OK or SEL.**

5. The command module will now attempt to send the file to your device. Follow your device's instructions on how to receive files (if any).

Figure 3.8: Bluetooth device selection page



NOTE: Bluetooth enabled devices such as computers and mobile phones will handle received files differently. Your device may ask you to specify the location of the received file. Some mobile phones however will automatically receive and save the file into a default location.

You can transfer any file on the card, however due to the limited bandwidth supported by Bluetooth it is recommended that you send small files only. To transfer video files, Pearpoint recommends using the USB connection.

Ethernet

Used for communicating with external third-party reporting applications, such as FlexiSight Manager or Wincan (Version 8 or above).

You can connect the P350 command module to a PC running compatible reporting software to control OSD and text position as well as retrieving telemetry data.

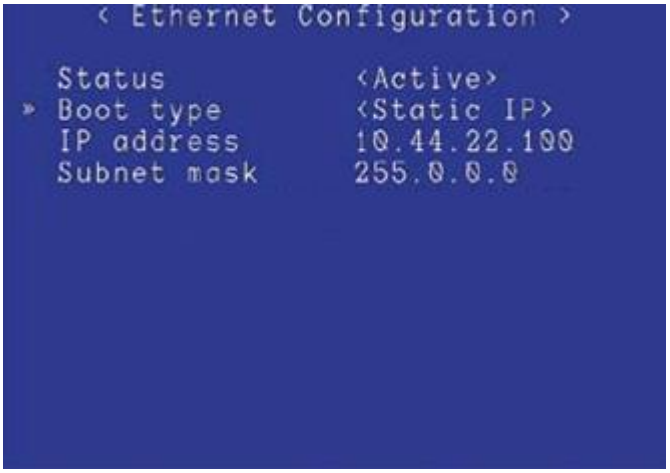
Ensure that you have the latest software installed (please note that the boot-up time for the command module will be longer if no Ethernet connection is present).

To connect to a PC you may use a standard or a crossed patch RJ45 leads connected to the RJ45 receptacle in the command module I/O panel. Use the standard RJ45 straight lead if you are connecting through a network hub or a router.

Use the crossed-patch lead if you are connecting to a PC directly.

To configure the Ethernet port MENU > SETUP > CONTROLLER > COMMUNICATIONS > ETHERNET.

Figure 3.9: Ethernet configuration



- Status indicates if the P350 system is connected or not. Use the ▲ and ▼ arrows to select a setting and press **OK** to edit.
- Boot Type: Choose between DHCP and Static IP. If you choose Static IP you have to configure the following three parameters:
    - IP address: enter a valid IP address
    - Subnet mask: enter a valid Subnet Mask

You will need to switch the system **OFF** then **ON** to make the settings active.

The latest P350 and Wincan V8 systems are configured at the factory to connect automatically. It is not recommended to change network settings unless you are an experienced user or IT professional.

3.5.3 Recording

FILE NAMES > PREFIX

You can enter a prefix (7 characters maximum) to be automatically added to all your recording filenames. Use this to help you to identify files created by a specific crew or operator.

New file names will have the following structure:

- **Prefix_filename_scheme_xxx.ext.**

For example, **Crew1_30Nov_001.MP4** where **Crew1_** is the prefix and **30Nov is the file name scheme chosen,** see below. **001** is the numeric counter.

NOTE: no spaces are allowed in the prefix.

FILE NAMES > SCHEME

Date or current job information, such as client name, site address and survey start and finish references can be chosen. See Reviewing your work: The Job Browser, for more details about Jobs and how to set them up.

You have 4 scheme options:

- **Date**: will use **ddmmm_xxx**. For example **30NOV_001**.
- **Client**: will use **name_xxx**. For example **J. Smith_001**.
- **Site**: will use **address_xxx**. For example **Elk Rd_001**.
- **Survey**: will use **start_finish_xxx**. For example **MH001_MH002_001**.

NOTE: Only the first 17 characters of the client name or site address or the first 8 characters of the start and finish references will be included in the file name to ensure the full file name remains visible at all times.

VIDEO TITLES

Enter this menu to add company and survey text and information to your recorded video (see figure 3.10).

This can include pre-existing company details, the client and survey address

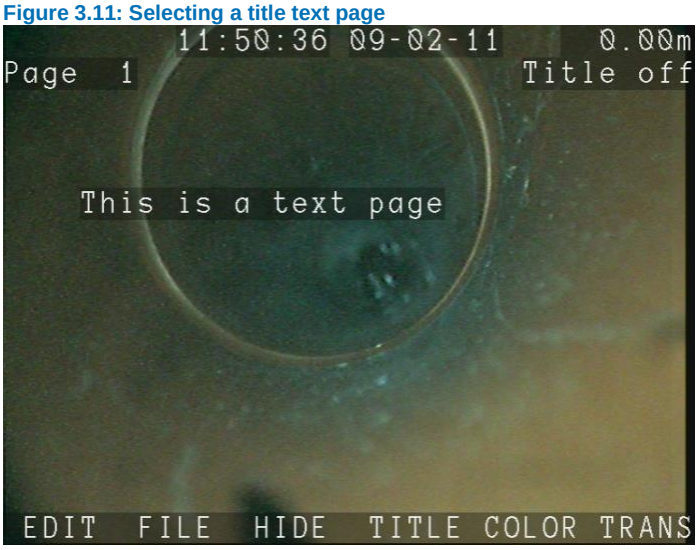
Figure 3.10: Setup Video Titles menu and an example of the text it adds to the beginning of your video

Choose from:

- **Company**: Display your company Information at the beginning of your video (from section Company Details Settings)
- **Client**: Display your clients information at the beginning of your video (from the client details form, section Company Details Settings)
- **Site**: Display site information at the beginning of your video.
- **Survey**: Display survey information at the beginning of your video.
- **Text page**: Add text pages to the video (see figure 3.11).
    - Scroll using ▲ or ▼ to select a text page (from page 0 to 9)
    - Press **EDIT** to change the text on any page.
    - The keyboard ▲ and ▼ arrows move the cursor around the screen. Allowing you to place the text anywhere you want. Use the keyboard or the arrows to add text to your page. Once the edit is complete press **OK** to return to the menu.
    - Press **TITLE** to add the text to the introduction of your video. Press **HIDE** to remove it. The status is in the top right, below the meterage.
    - Text pages are displayed numerically (1, 2, 3, 4).
- **Observations**: Display observations in the video recordings in real time.

NOTE: Titles are limited to 13 rows. As the information is customizable and may exceed this limit, only the first 13 entries are displayed.

Figure 3.11: Selecting a title text page



QUALITY

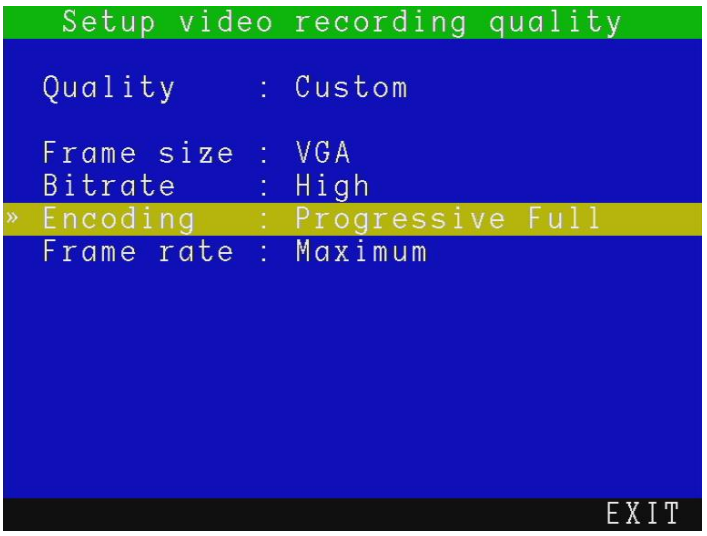


Figure 3.12: Setup video recording quality

The P350 controller can record video using several quality options, advanced users can customize these.

There are three pre-defined video quality profiles. High, Medium and Low. High uses up more memory but generally provides a better video quality, whereas the other options trade lower video quality for longer recording time on the memory drive.

NOTE: “Full” frame size cannot be set with “Progressive Half” encoding.

The table below provides an overview of the predefined video quality settings.

Video Quality Profiles				
Quality	High	Medium	Low	Custom
Frame size	VGA	VGA	QVGA	user defined
Bitrate	High	Medium	Low	user defined
Encoding	Progressive half	Progressive half	Progressive half	user defined
Frame rate	Maximum (full)	Maximum (full)	Maximum (full)	user defined
Recording time hrs*	1:45	3:45**	9:00**	varies

Figure 3.13: Video Quality profiles

*Approximate recording time based on 2GB storage memory device.
** Recordings exceeding 2 hours in length are split into multiple files

- **Quality**: You can choose between 4 different profiles: High, Medium, Low and Custom.
- **Frame size**: selects the dimensions (in pixels) of the recorded video. The options are:
    - Full: PAL (720x576 pixels) or NTSC (720x480 pixels) depending on your camera.
    - VGA: 640x480 pixels.
    - QVGA: Quarter VGA, 320x240 pixels.
- **Bitrate:** sets the bitrate (memory usage in megabits, or Mb, per second of recording). Select between High, Medium and Low.
- **Encoding**: sets the encoding. Select between Progressive Full, Progressive Half or Interlaced.

NOTE: Selecting interlaced will create better quality video but it will not play on a PC running Windows XP or VISTA OS unless a suitable CODEC is installed. FlexiSight Manager supports progressive encoding on Windows XP and VISTA, while interlaced video works only on Windows 7.

- Frame Rate: sets the number of frames per second that will be recorded / displayed. Select between:
    - Maximum (30FPS for NTSC and 25FPS for PAL).
    - Medium (20FPS).
    - Minimum (10FPS).

NOTE: Bitrate is the only parameter that will affect your recording sizes. Higher bitrates will result in better video quality and larger file sizes.

3.5.4 Pitch Profiler

The Pitch Profiler is a crawler-based sensor that monitors crawler distance, inclination and can then use this information to work out the pipe profile. This information can then be used by FlexiSight Manager (paid option) to map the pipe.

CAUTION: Be aware it assumes the crawler travels perfectly along the floor of the pipe. Debris, driving up the sides, component tolerances and other factors might affect the accuracy of your data, please review carefully.

By default the pitch logger is turned on. To turn it off go to MENU > SETUP > EQUIPMENT and set the Pitch Profiler: Status to "OFF". Every time you create a survey, this will automatically store the pitch profile log file in the survey folder, for use with FlexiSight Manager at a later date.

You will receive an on-screen message to confirm your selection. A USB memory drive or a Compact Flash Card must be installed.

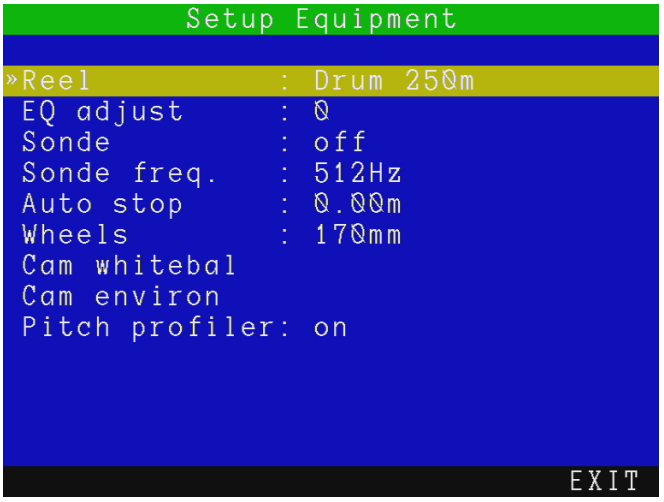


Fig 3.13a Pitch Profiler activation screen.

CAUTION: We cannot accept any liabilities for inaccurate data, or consequential decisions made following the use of the pitch profiler.

NOTE: Do not remove the USB/Compact Flash card while surveying a system as the pitch profiler may be corrupted.

3.6 Crawler and reel settings

From **SETUP > EQUIPMENT > REEL,** enter the **Reel** menu to select your correct reel type and/or drum length.

NOTE: Do this every time you use a different reel with your controller. Having the wrong reel/length selected will affect the accuracy of the distance counter (if using a pushrod system) and video quality. If you are using a drum system with a non-standard length choose the nearest length settings.

Select between:

- **P341 Plumbers 100ft/30m or 200ft/60m, Plumbers MK2 100ft/30m or 200ft/60m**
- **P341 (P331) 120ft/35m**
- **P342 (P332) 200ft/60m or 400ft/120m**
- **P343 (P333) 500ft/150m**
- **Drum 150 / 200 / 250 / 305m - 500 / 650 / 850 / 1000ft.**

NOTE: The settings below are not available when using a pushrod system.

EQ Adjust: Manual adjust the video equalization setting from numeric options, this may improve the image.

Sonde: Activate Sonde when available

Sonde Freq.: Select the Sonde frequency suitable for your survey and Radiodetection locator. 512Hz, 640Hz, 8kHz and 33kHz frequencies available.

Auto-stop: Set the distance where to stop the crawler when retrieving.

Wheels: Set the wheel size and type, used for accurate distance measurement and safe, efficient drum retrieval (wheel size affects crawler and drum speed, a mismatch may cause damage).

⚠ Caution: Setting the wrong wheels will effect drum speed when retrieving and it may cause the crawler to topple

Cam Whitebal: Set the Camera white balance.

Cam environ: Setting the camera to pipe or surface mode can improve the video quality in different environments, this can improve the video when used in pipe vs driving around outside.

After a pushrod reel has been selected once, the system will remember this and pressing the i character on the keyboard will toggle between these two modes.

3.7 On-screen Display Settings

SETUP > ON-SCREEN INFORMATION

From this menu you can customize the information provided on the display. Depending on the system and camera used you will be able to turn information fields ON or OFF, and customize their position and/or look.
.
There are 5 options:

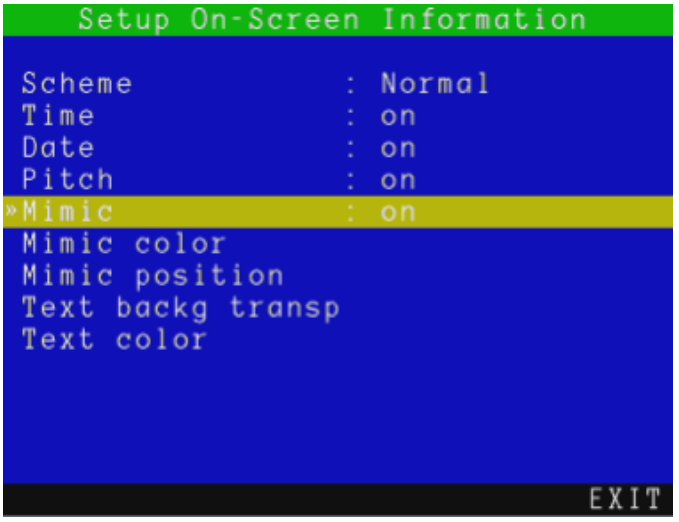


Figure 3.14: On-Screen Information

- **Scheme**: Change layout. See below for more information.
- **Time**: **ON** or **OFF** to display or hide the time.
- **Date**: **ON** or **OFF** to display or hide the date.
- **Pitch**: **ON** or **OFF** to display or hide the inclinometer.
- **Mimic**: **ON** or **OFF** to display or hide the mimic display (PT and PTZ cameras only)
- **Mimic color:** Select a different color for the mimic. For example, a white mimic may not be visible on a white image.
- **Mimic position:** Move the mimic location. For example if you need visibility on a specific part of the screen.
- **Text backg transp**: Change transparency level from solid to transparent for the menu background.
- **Text color**: Change text color.

NOTE: Hiding any on screen information filed result in these fields not been recorded in your video and photos.

Choosing an On-Screen Information layout

The P350 controller offers a choice of 3 different layouts for the position of the date, time and counter fields and the position and size of any text page you may decide to show on the screen.

Deciding what layout to use is critical before starting your recordings as layouts cannot be modified after the recording is created.

To set your preferred layout navigate to **Scheme** and choose between three layouts: **Normal**, **TV** and **Custom**.

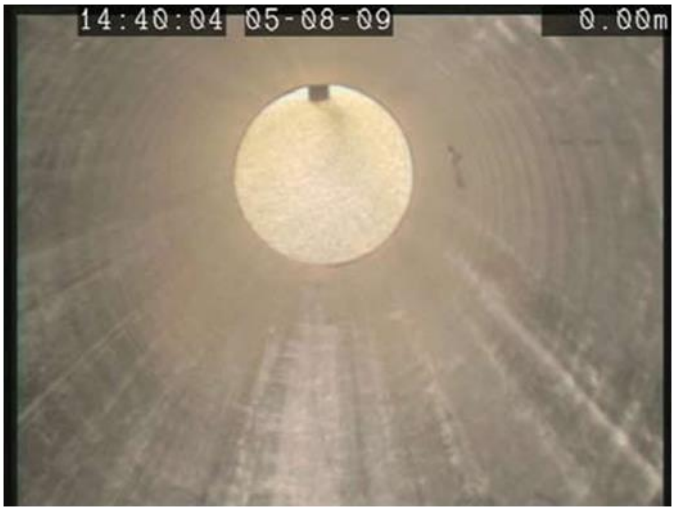


Figure 3.15: Normal Layout

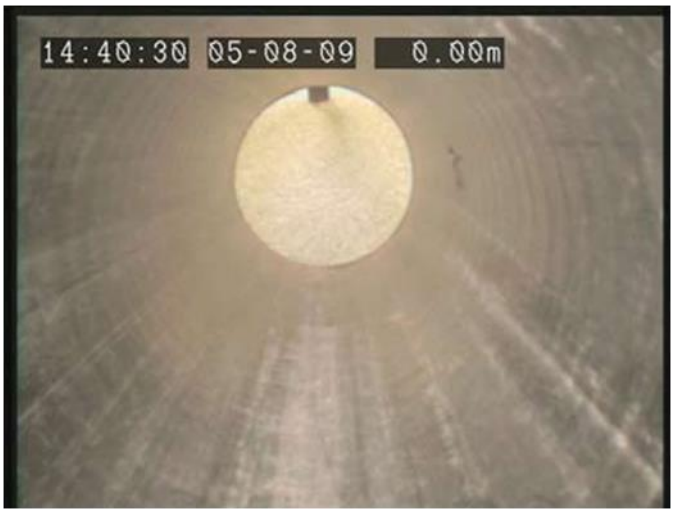


Figure 3.16: TV Layout

Normal Layout

This is the standard layout optimized to make use of the entire screen. On-Screen information fields are positioned at the very edges of the display. Overlaid text pages will also have characters which may be positioned at the edges of the display.

TV Layout

This layout is optimized for a DVD Recorder/TV screen. On-Screen information fields and overlaid text pages are positioned in the graphic safe area of the display.

Custom Layout

This layout is customizable. The position of time, date and distance counter fields can be moved anywhere on the screen.

Text pages may still have characters which may be positioned at the edges of the display.

Figure 3.17: Custom Layout

To personalize this layout, select **Custom layout to** enter the layout setup screen:

- Select the field you wish to move: **TIME**, **DATE**, **COUNT or PITCH** and use the arrow keys to position the field. The field selected will flash on the screen.
- Press **RSTOR** to restore the default position.
- Press **OK** to confirm your choice and leave the setup screen

⚠ CAUTION: Be careful not to overlap the On-Screen information fields as this will affect their readability on the screen and in recordings.

3.8 Company Details Settings

The P350 controller allows you to customize your system by storing your company details and logo on the controller. These details are used to personalize reports and the video title screen.

NOTE: Video titles are optional.

Once you save your company's information you will not need to enter it again unless you perform a factory reset.

Figure 3.18 Company information menu

To set your company details:

There are 10 company fields to fill out:

- **Logo:** use this field to enter your company logo (See below).
- **Company:** use this field to store your company or trading name (30 characters).
- **Crew**: use this field to record the name of the crew or individual who is in charge of the P350 system (30 characters).
- **Address:** use this field to record your company's street address (30 characters).
- **Town:** use this field to record your company's city or town (30 characters).
- **State / County:** use this field to record your company's State or County (20 chararacters).
- **ZIP / Postcode:** use this field to record your company's ZIP or postcode (10 chararacters).
- **Telephone:** use this field to record your company's contact telephone number (20 chararacters).
- **Fax:** use this field to record your company's fax number (20 characters).
- **Email:** use this field to record your company's contact email address (30 characters).

Press **CLEAR** to delete the selected field data.

Press **RESET** to delete all data.

Adding your company logo

To enter your company logo, copy a JPEG version of it (32KB maximum) into the root of your memory storage device and insert it in the controller.

NOTE: The root directory refers to the top-level directory or folder of your memory storage device.

1. Browse the root of the memory storage device.
2. Press **SHOW** to check the highlighted JPEG logo.

NOTE: The controller can only display pictures with width and height in multiples of 16 pixels. Pictures of other sizes will not be displayed by the controller but will work in the final report.

3. Press **BROWS** to continue browsing.
4. Press **USE** to select the desired logo file and return to the company setup menu.
5. Press **CANCL** to cancel the operation and exit.

3.9 System Maintenance menu

The maintenance menu allows you to perform infrequent operation such as updating the controller software, formatting your memory device or viewing your controller system log.

From the Setup screen enter the **Maintenance** menu.

There are 9 maintenance options available:

- **Update System Software**: Select this to update the system software.
- **Status Information**: Service personnel option to access detailed information about the controller internal hardware components.
- **View log**: Select this to review system logs to analyze activity. Can be used to diagnose faults.
- **Tractor Power**: Toggle power to the tractor.

Figure 3.19 Maintenance Menu

NOTE: The Crawler and Camera will no longer work when the power is off.

- **Calibrate tractor numeric pitch**
- **Restore factory settings**: Select this to restore your controller to its factory settings.

NOTE: Restoring the controller will erase all your system settings, personal preferences and your company details.

- **Format Card**: Select this to format your Compact Flash card.
- **Format USB**: Select this to format your USB flash drive.

  If you format the Compact Flash card or USB Flash drive using your PC, format the card using the FAT32 file system. Ask a Pearpoint representative if in doubt! Cards formatted in different formats or by a media player or digital camera may not work.

⚠CAUTION! Formatting the Compact Flash card or USB Flash drive will erase all existing data permanently; this includes reports, photos and videos. Formatting cannot be undone so proceed with caution!

- **System customization:** Enter this menu to load a new template for your job details and/or modify the built-in defect codes. See the Appendix for further information

Update your System software

Pearpoint may issue P350 system software updates to enhance system performance. To find out if Pearpoint has released a new software update, please visit www.radiodetection.com or contact your local Pearpoint representative. It is highly recommended that you periodically check for new software releases and update your controller when software is made available. If you have two systems we would recommend upgrading both to the same version as they may not necessary be fully compatible with each other.

These Controller Software Updates are free of charge and come as a "matched set" of system software. This is critical in some scenarios, particularly the camera/tractor combination.

NOTE: Your system may already have the latest software installed. Check the software version of the file you are about to use or download against your controller's software version which you can access by pressing **Fn + F4** together.

If using a memory storage device that contains survey files, or other valuable files, be sure to back up the data on to your computer before continuing this procedure.

⚠ CAUTION: Do not switch off the controller or remove the memory storage device while the upgrade is in progress. Failure to comply may render the controller inoperable.

Pearpoint recommends using the mains adaptor for software upgrades. This is to ensure a reliable power source.

NOTE: The system should be completely assembled when attempting to upload new software.

1 Check for new updates at **www.radiodetection.com**, by selecting **Downloads**, **Inspection**, and **Software Downloads**. P350 users should select **'Pearpoint P350 Software Updates'**.

2 Download the new software to your computer.

3 Double-click on the file downloaded to extract the update files. They will be a number of files ending with .bin with names like controller.bin, tractor.bin or drum.bin. There may also be some release notes with the package.

4 Save files to the root folder (top level) of the memory card you are using (remove any older versions).

5 Insert your removable memory device into your controller and turn it on.

6 Navigate to the **MENU > SETUP > MAINTENANCE**, select **UPDATE SYSTEM SOFTWARE** and press **OK**. Follow the on-screen instructions to complete the upgrade (see fig 3.20). Status messages may include

OK	**No Update required**
NO FILE	**No update file (.bin) on storage device**
EXPECTED	**Incorrect software on device**
UPDATE	**Update possible / recommended**

7 The controller will now update the software and then prompt you to restart the module by pressing **OK**. The update process may take several minutes. Do not remove the memory card or switch off the system until the update is complete.

The system has now been updated.

⚠ CAUTION! Do not remove the memory card or switch off the system while the upgrade is in progress. Failure to comply may render the system inoperable.

NOTE: Upgrading components with the latest software may take several minutes. If the upgrade is successful, the command module may prompt you to reboot. Press **OK** to reboot the system.

NOTE: If you receive any error messages, check that you have copied all .BIN files to the root of the card and then try again.

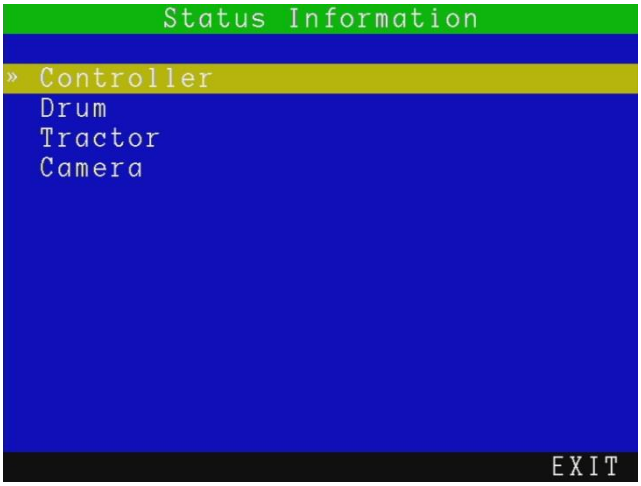
Figure 3.20: Update Control Centre

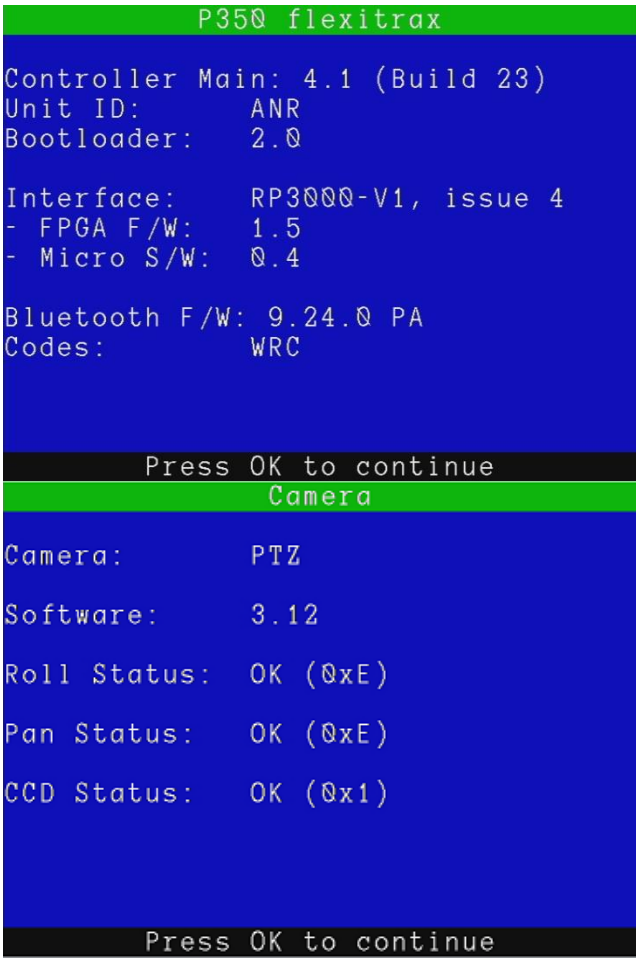
The ‘software versions’ screen can also be access by holding **FN** + pressing **F4** on the controller.

Status Information

This section is used to provide more detailed information about the system software and hardware configuration. This can be useful for service diagnostics. See figure 3.21 which shows an example of the camera and controller diagnostic windows.

Figure 3.21 Status Information screens





Tractor Power

This toggles the power to the Tractor on and off.

This may be useful to change the downhole equipment (crawler/camera/lighthead) without powering down the surface equipment or to release the crawler brake If communication is lost to the crawler.

⚠ CAUTION! This will deactivate the brake and may cause the crawler to roll into hazardous situations.

Calibrate Tractor Numeric Pitch

Using this feature on a flat surface calibrates the numeric pitch in order to maintain accuracy. Follow the on-screen instructions.

⚠ CAUTION: ensure the wheels are evenly sized and matched sets are used. This information is for information only. We cannot take responsibility for inaccurate data or consequential losses caused by works decisions informed with this information.

Restore Factory Settings

You can restore the system to factory default settings by selecting this menu..

Press YES (F1) to restore, or **NO (F6)** to leave the menu.

NOTE: This action cannot be undone.

Format Card / Format USB

Enter these menus to format your Compact Flash card or USB flash drive

⚠CAUTION! Formatting the Compact Flash card or USB Flash drive will erase all existing data permanently; this includes reports, photos and videos. Formatting cannot be undone so proceed with caution!

System Customization

The P350 controller uses Job templates to organize the inspection's recordings and observation into JOBS (Creating Reports) and to assist in the creation of reports.

You can customize your Job templates by using FlexiSight Manager.

1. Copy the Romdrive2.bin file produced by FlexiSight Manager into the root of your storage device.
2. Select **Install from storage device** to install the custom Job template.

or

3. Select **Remove** to reset the system to the default Job template.
4. Press **OK** to reboot.

For further instructions consult the Flexisight Manager user guide.

Section 4 - System operation

This section introduces the procedure for deploying the P350 flexitrax system and inspecting pipes and conduits.

4.1 Emergency stop

The Emergency Stop button located on the PSU will completely shut down the command module and all system components when pressed. As a fail-safe, the system must be reset before you can switch on the system again. Do not reset the system until it is safe to do so. To reset the system ensure the power is switched off at the main switch. Rotate the Emergency Stop button clockwise and then switch the power back on. Switch the power off while the equipment before disconnecting any system components or if the system is not yet connected.

NOTE: Initiating an Emergency Stop may result in loss of data on the memory card, particularly if a recording or playback was in progress.

4.2 Crawler Deployment

Once the system is correctly set-up, you can deploy the crawler in the pipe or conduit you wish to survey. Care must be taken when deploying the crawler, particularly if it is being deployed into deep conduits and cisterns via manholes with limited access.

WARNING: The crawlers are heavy! Observe proper lifting procedures when handling, deploying and removing the crawler. Never lower crawlers or other heavy equipment into manholes while personnel are working in the manhole.

Before deployment

Assess your deployment and safety requirements before you begin. Different environments may pose risks and challenges that you may be unaccustomed to.

Check that no hazardous gases are present. The P350 flexitrax is not suitable for use in potentially explosive environments.

We recommend the use of downhole and manhole rollers as there is a risk of damaging the crawler cable during a survey. They should be set before the crawler is lowered into the manhole and deployed in place before the survey starts.

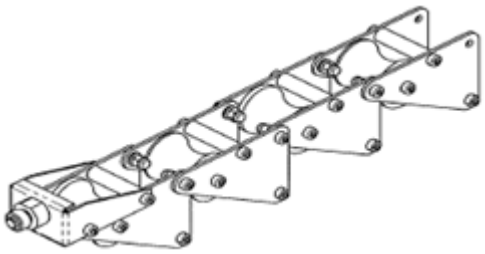


Figure 4.1: Downhole cable rollers (MK2)

Using the crawler deployment tool

The crawler deployment tool has the following components:

- 1 Crawler Grab
- 2 Toggle clamp
- 3 Bowden cable
- 4 Rods

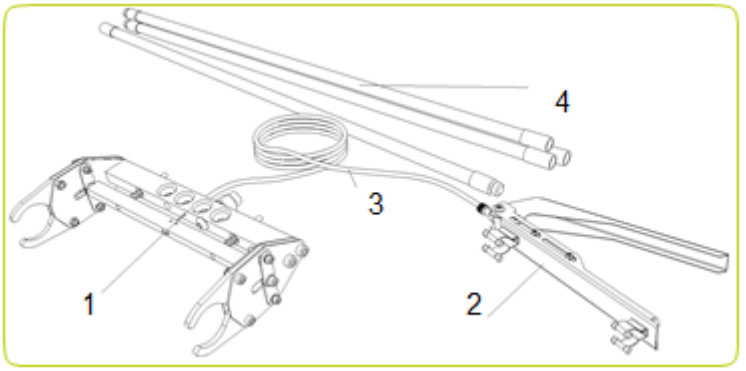


Figure 4.2: Crawler grab kit

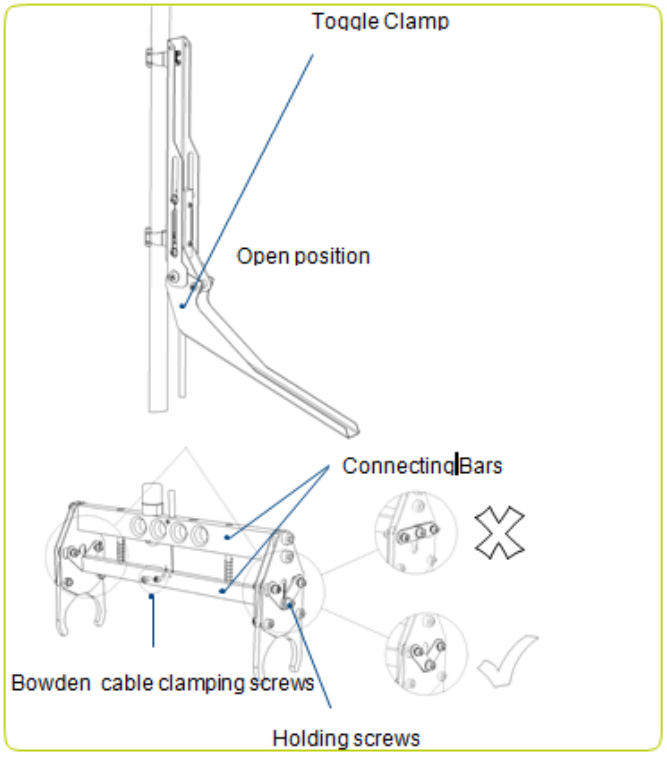


Figure 4.2: Crawler grab setup

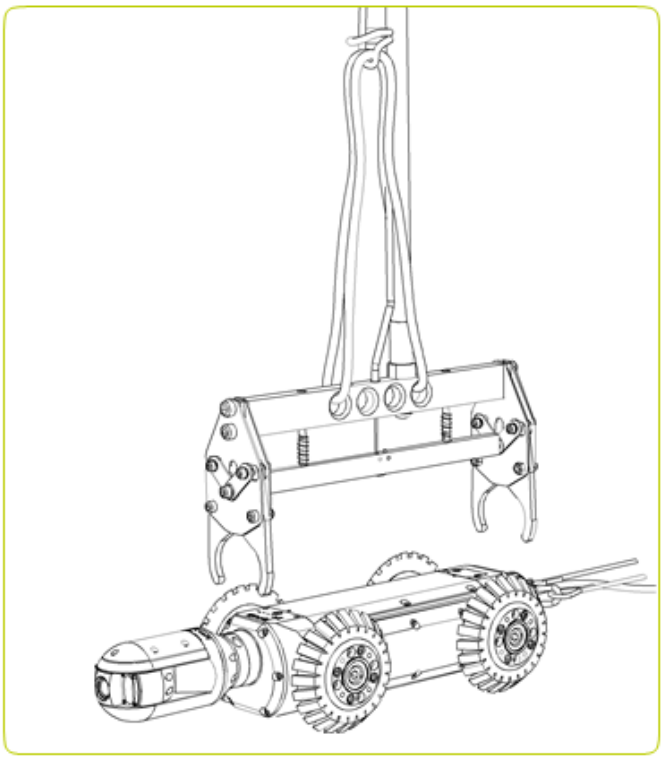


Figure 4.3: Crawler grab and crawler

⚠CAUTION! Do not attempt to lift the crawler by the cable. Do not drop the crawler as it may damage the camera and the system's electronics

Before you attempt to assemble and use the crawler grab tool, ensure that all parts are included in the kit.

⚠ CAUTION! The rods are not designed to bear the weight of the crawlers and all attached accessories. Use durable rope (not supplied) to lower and remove the crawler. Choose high-quality rope that is certified to hold at least 50kg /110lb (for P354 crawlers) or 100kg/220lb (for P356 crawlers).

Testing and Adjustments

1. Without assembling the positioning rods, place the toggle clamp away from the crawler grab as far as the Bowden cable allows, ensuring a straight run from the toggle clamp to the crawler grab.
2. Fully open the toggle clamp. Ensure the lower connecting bar's holding screws, at both ends, are in the lowest position. If they are proceed to point 6.
3. If an adjustment is required, slacken both cable clamping screws (see figure 4.2).
4. Force open the two connecting bars as far as possible and pull taut the cable using suitable tool (i.e. pliers).
5. Fully tighten the cable clamping screws to secure the now taut Bowden cable in place.
6. Test adjusted deployment tool by opening/closing toggle clamp and noting the action on crawler grab.

Installation and deployment

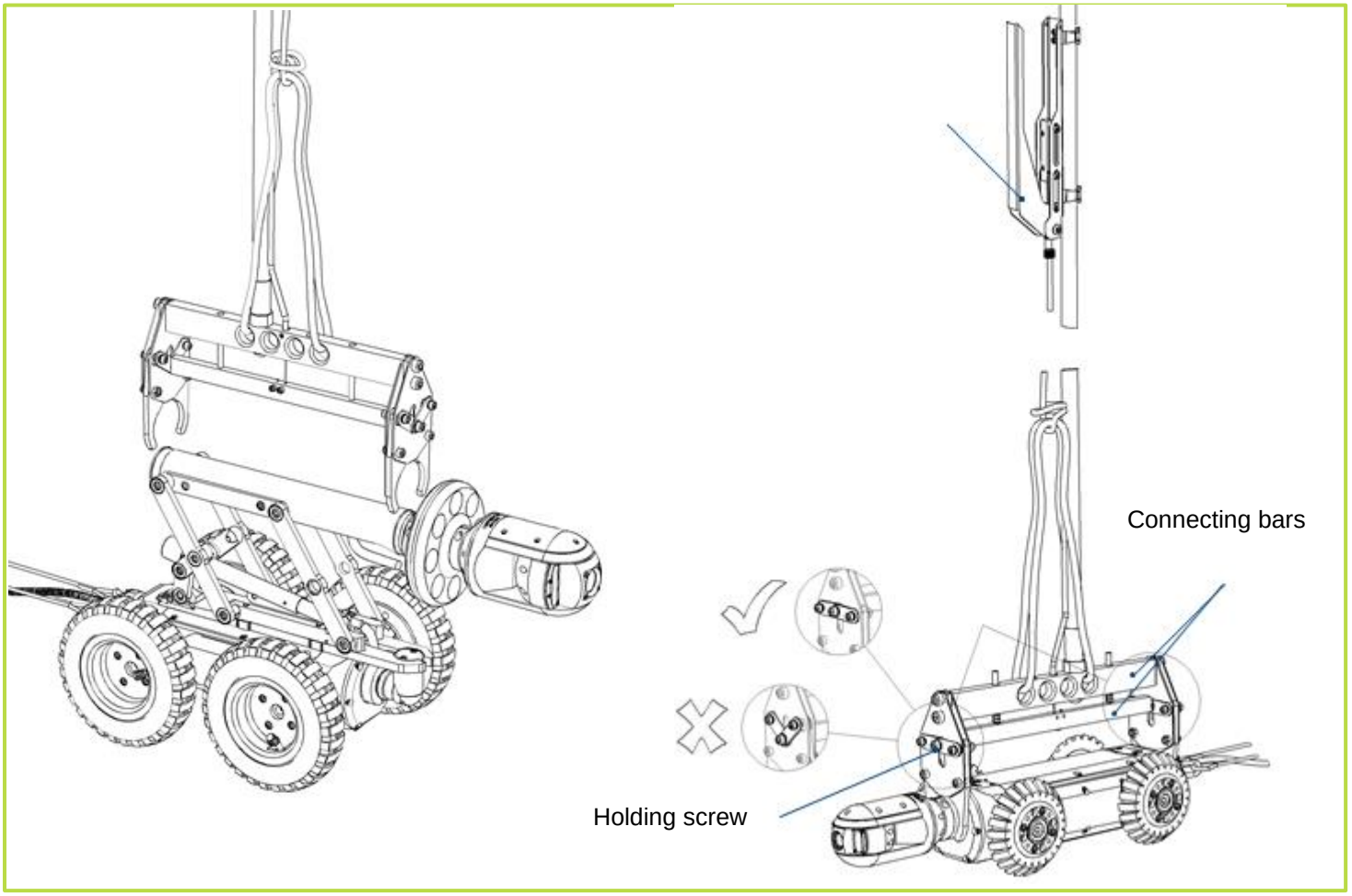
⚠ CAUTION! Failure to follow this procedure may result in severe damage to the crawler and camera system

1. Assemble as many rods as are required by screwing them together.
2. Attach the rods to the crawler grab.
3. Attach a sufficient length of durable rope to the crawler grab.
4. Attach the toggle clamp to the top section of the rods.
5. Position the grab over the crawler (see Figure 4.3) and close the toggle clamp to lock the crawler in place (Figure 4.5).
6. If you are using the large adjustable elevator (see Figure 4.4), lock the crawler grab to the elevator.
7. Check that the crawler is clamped securely.
   Ensure the lower connecting bar's holding screws, at both ends, are in the upmost position as per figure 4.5.
8. Use the grab rope to lower the crawler into manhole. If required, adjusts the toggle clamp's position to ensure it remains above ground.
9. When the crawler reaches the bottom of the manhole, use a combination of the rope and rods to position the crawler in the desired orientation.
10. When the crawler is positioned to your satisfaction, release the toggle clamp's lever to disengage the crawler.
11. Pull the crawler grab up to the surface.

NOTE: The crawler may spin as it descends; use the rod to guide and steady the crawler

Figure 4.4: Crawler grab and crawler with attached elevator (left)

Figure 4.5: Crawler grab in the closed position (right)



Cable deployment rollers

The optional cable deployment rollers help protect the cable from scoring on concrete and other abrasive materials. Pearpoint recommends that you always use cable deployment and removal rollers.

Figure 4.6 demonstrates the use of a manhole roller and the protective downhole tiger-tail rollers. Note the position of the tiger-tail roller below the surface.

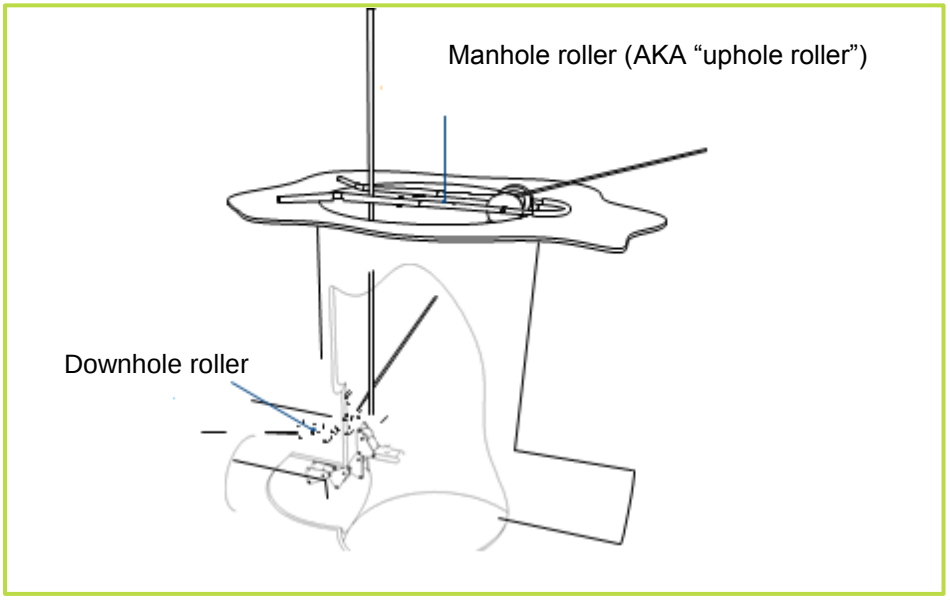


Figure 4.6: The use of rollers to reduce cable wear

Distance counter and Auto Stop point

Once you have deployed and positioned the crawler in the manhole, using manhole rollers to protect the cable and ensuring that the cable protection spring has cleared the drum rollers, you should zero the distance counter.

The zero (0.0) position is used to decide when to stop the system when reversing the crawler. This is a safety feature.

You can reset the counter to zero at any time during operation by pressing the ▲ and ▼ keys simultaneously or by pressing **F10.**

You can also set a different stop point called **AUTO STOP**. The system will stop reversing when this stop point is reached.

To set this limit: move the crawler to desired counter position, go to **MENU > SETUP > EQUIPMENT > AUTO STOP**.

Please note that the Auto Stop position is saved by the system and it will be active until is reset.

To reset the Auto Stop point: zero the counter and set this to become the new Auto Stop limit.

You can also enter a new distance (up to ±327m).

1. Press **F9.**
2. Enter the distance and press **OK** to confirm.

NOTE: Resetting or varying the distance counter during a survey will render the automatic retrieval function ineffective as the crawler will return to the new zero position and not the point where the crawler began the survey.

In custom layout you can move the OSD counter field around the screen to suit your preferences. See SectionOn-screen display (OSD) for more information.

Sonde

The P350 crawlers feature an integrated, multi-frequency sonde. The Sonde allows you to locate the crawler’s position using a Radiodetection cable and pipe locator such as an RD7000+DL.

You can choose the transmitting frequency in the Sonde settings menu which you will find by going to **MENU > SETUP > EQUIPMENT**

1. Scroll down to **SONDE**, press **OK** and select your desired option.
2. Scroll down to **SONDE FREQUENCY**. Press **OK** and use the ▲ and ▼ keys to select the desired transmitting frequency between: **512Hz, 640Hz, 8kHz and 33kHz**.
3. Press **OK** to confirm the selection and exit to the previous menu.

You can also use the shortcut **Fn + F5** to activate or de- activate the sonde.

For more information on locating the sonde and frequency selection, please refer to the documentation supplied with your cable and pipe locator. The sonde should be used as an estimation tool for assisting with product location.

4.3 Driving the P354 and P356 Crawlers

This section describes driving and retrieving P350 crawlers when used with the manual or powered drum. Although the principle is the same, the powered drum can retrieve the cable and crawler automatically. You can use the controller, pendant or keyboard arrows to drive the crawlers.

NOTE: Make sure you have set the correct wheel size before you attempt to drive the crawler.

Pearpoint recommends that you practice driving the crawler on the surface in a safe environment before attempting to deploy the crawler underground for the first time. In addition to practising driving techniques, it provides a good opportunity to understand how the system operates.

Tilt protection

P350 systems offer automatic TILT protection. This will halt the crawler in hazardous tilting situations, when its roll first exceeds 35°. The user will be shown a tilt hazard warning, but can restart the crawler movement if necessary.

4.4 System stop

You can stop the drive system, including the crawler and the powered drum at any time by pressing the spacebar, Ctrl + C or on the controller, EXCEPT when using the Pendant, for safety this is controlled via the Pendant or the emergency stop button on the drum.

While stopped, the crawler will automatically brake. Press the spacebar, Ctrl + C or to toggle the Brake.

⚠ CAUTION! System stop is not a substitute for making an Emergency Stop. If there is any emergency use the Emergency Stop button located on the PSU.

Driving and OSD

To drive a crawler, you must be on the main OSD video screen.

Previous generations of software will only allow tractor movement when the **DRIVE** button is pressed. Be aware of this change which allows more efficient menu and feature use

NOTE: If you have selected a Pushrod reel, **ROD** will appear on the main screen. Crawlers and camera will not work.

Status

The status field provides important information about connected devices and the integrity of the connection signal. The following information are provided

- **T**: crawler present.
- **B**: crawler present and braked.
- **P**: powered drum connected.
- **M**: manual drum connected.

When the T or B and P or M icons are colored green it means that the devices are correctly connected and the communication link is good. If the T or P change to red then it means that either the crawler (T) or the powered drum (P) has stalled or is about to stall.

If the T, P or M characters are not displayed then the crawler, powered drum or external power supply are not connected correctly or may be malfunctioning.

NOTE: The P354 and P356 crawlers feature an automatic roll-over drive correction system: if they roll-over for any reason the direction of movement will remain the same.

Manual system

Moving forward

To move the crawler forward, press ▲ (or press forward on the gamepad controls).

Pressing the ▲ arrow repeatedly will increase the crawler's speed. Holding it down will accelerate the crawler until it reaches its maximum speed or release the key.

The gamepad controller has direct drive control – if you let the crawler joystick return to centre it will stop all movement (unless 'cruise control' has been activated).

To slow the crawler, press ▼. Holding it down will slow it down quicker. The gamepad controller has proportional controls – when pushed slightly forward it will move forward slowly, this works in all directions).

NOTE: If you continue to press ▼ when the crawler has stopped, it will move in reverse. The crawler will automatically stop when the cable counter reaches 0.0 or the Auto Stop point (if set).

Reversing

⚠ CAUTION! When reversing or retrieving the crawler, ensure that the cable is retrieved at the same or higher speed than the crawler. Failure to do so may cause the crawler to get tangled in the cable and stall.

Use the crank handle for winding in the cable. Use the manual wind layering handle to ensure the cable is laid evenly in the drum.

You can reverse the crawler in Manual (**MAN)** or Automatic **(AUT).** Press **F3** to toggle between Automatic and Manual driving modes.

Manual mode

In Manual mode, the crawler will drive with no assistance from the drum.

NOTE: A message will flash on your screen warning of a cable hazard. This message will not be recorded to video.

Press ▼ to reverse the crawler. Increase the speed by holding or pressing ▼. Decrease the speed by holding or pressing ▲ .

Ensure that you wind in the cable at the same or higher speed than the crawler as this may cause the crawler to get entangled in the cable and stall. Use the crank handle to aid reversing.

Automatic mode

This mode is primarily for powered drums. It allows the user to drive the crawler at constant speed in either direction with assistance from the powered drum. When driving forwards, the user controls the crawler speed. When driving backwards, the user sets a target cable speed. The drum will automatically adjust its speed to maintain a constant cable speed as it pulls the crawler backwards.

Pressing ▲, while the crawler is pulling or still, will increase the crawler speed. Pressing ▲ while the drum is pulling will decrease the target cable speed.

Pressing ▼, while the drum is pulling or still, will increase target cable speed. Pressing ▼ while the crawler is pulling will decrease crawler speed.

NOTE: In Automatic mode, the mimic speed bar is disabled. The crawler's speed is automatically set to match the retrieval speed of the cable. Steering is disabled in automatic mode.

NOTE: Crawler wheel size must be correctly set for Auto and retrieve modes to function correctly. Failure to set correct wheel size could result in damage to the system.

Powered drum

Moving forward

To move the crawler forward, press ▲ .

Pressing ▲ repeatedly will increase the crawler speed (forward). Holding the ▲ key will accelerate the crawler until it reaches maximum speed.

To slow the crawler, press ▼.
Subsequent or sustained presses will decelerate the crawler faster until it comes to a stop.

NOTE: If you continue to press ▼when the crawler has stopped, it will move in reverse.

Reversing

NOTE: The crawler will automatically stop when the cable counter reaches 0.0. However, the crawler's momentum may cause it to roll a short distance beyond the 0.0 position. Please allow for this when you deploy the camera and zero the distance counter.

The powered drum supports two driving modes: Automatic and Manual. In Manual mode, the crawler and drum operate independently. Manual driving gives you more control over the crawler and drum but can increase the risk of jamming the cable around the crawler wheels, particularly if the crawler reverses over the cable. Press **F3** to toggle between Auto and Manual driving modes. This is displayed in the top left of the display.

From a stationary position, press ▼ to reverse the crawler (or down on the crawler drive controls).

Pressing ▼ repeatedly will increase the crawler reverse speed (except on the gamepad controls).

Decrease the speed by holding or pressing ▲. If you continue to press ▲ when the crawler has slowed to a standstill, the crawler will start moving forwards (except on the gamepad controls).

In automatic mode, the powered drum will automatically retrieve the cable as the crawler reverses. To avoid the risk of jamming the wheels in the cable, the crawler will reverse at a slower speed than the cable.

In manual mode, the drum will not retrieve the cable and you must synchronize the speed of the crawler and the cable. To rewind the cable in manual mode, hold the **Fn** key and press ▼ on the keypad.

Decrease the speed by pressing **Fn** + ▲ together.

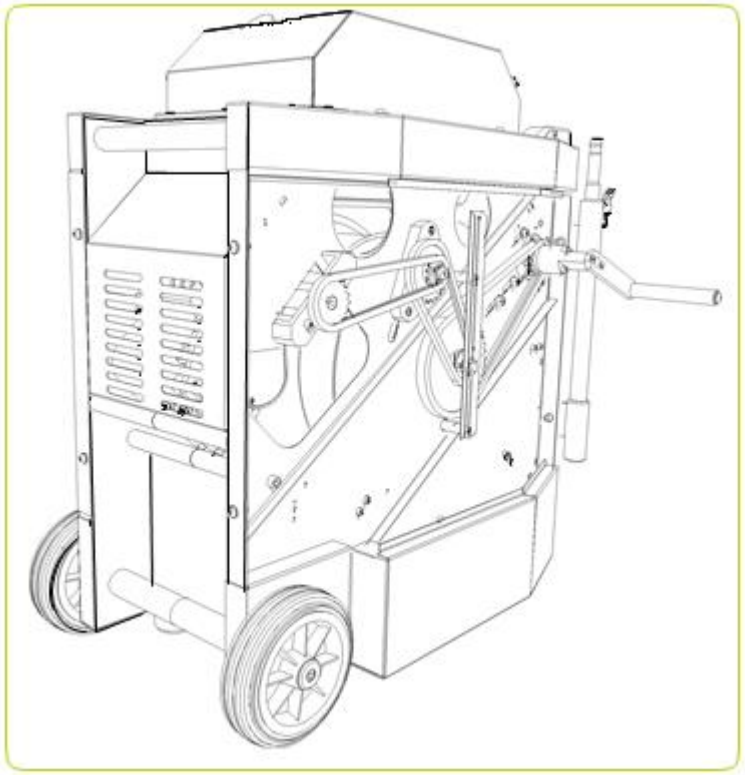
The system will stop when the Auto Stop limit or the zero point are reached.

⚠CAUTION! In manual mode, make sure the cable is retrieved faster than the crawler speed. This will help to avoid the risk of jamming the cable in the crawler wheels.

Manual retrieval with the crank handle

If necessary, use the crank handle to manually wind the cable back into the drum. Before you start, disconnect the power lead to ensure that the system is not powered. The crank socket is located under the side panel closest to the controller socket. The panel is secured with socket- head screws. Remove this panel using a metric Allen key.

Figure 4.7: Crank handle for powered drum



Attach the crank handle to the crank socket located in the gear on the top right-hand corner of the compartment using the supplied socket head screws.

⚠CAUTION! Remove the crank handle and replace the side panel before reconnecting power to the system.

Steering (P356 crawler only)

The P356 crawler will steer left and right, allowing you to navigate pipes with ease. The crawler steers by changing the speed on the left or right motors.
You can steer the crawler when it is moving or when it is stationary. Steering whilst reversing is possible in manual driving mode only.

NOTE: Steering whilst moving is proportional to the crawler speed: the faster the crawler moves the bigger the steer.

When the crawler is stationary, it will turn on its own axis. Be careful as the cable can get jammed around the wheels.

To steer right, press ►. Hold the key to turn faster. To steer left, press ◄. Hold the key to turn faster (or use the proportional gamepad controls).

Whilst moving you can achieve a tighter turn by using the lock steer function.

In this mode one set of wheels will lock. This gives a tight turn, but will reduce the crawlers pulling power.

You can lock steer the crawler by pressing **ALT +** ◄ or ►at the same time.

You can exit this mode by pressing ▲.

To stop turning the crawler when it is stationary you can also press or the spacebar.

System diagnostics

If any issue is detected, a message will be displayed, describing the fault and the recommended actions to be carried out.

This is the list of faults and recommended actions:

Faults	**Actions** (before consulting service)
Interface module error	-
No Drum control, no video	Check for drum connected and powered, check link cable
No Drum control	Check link cable
No Tractor control, no video	Check for tractor connected, check down- hole cable, check tractor connector
No Tractor control	Check down-hole cable, check tractor connector
No camera control, no video	Check for camera connected, check camera connector
No video, no video at Drum	Check tractor connector, check down-hole cable, check camera connector
No video, video at Drum OK	Check link cable
No application running on drum/tractor/camera	Upload software
Software mismatch	Get latest software and update

Press **OK** to close the fault message and continue operations.

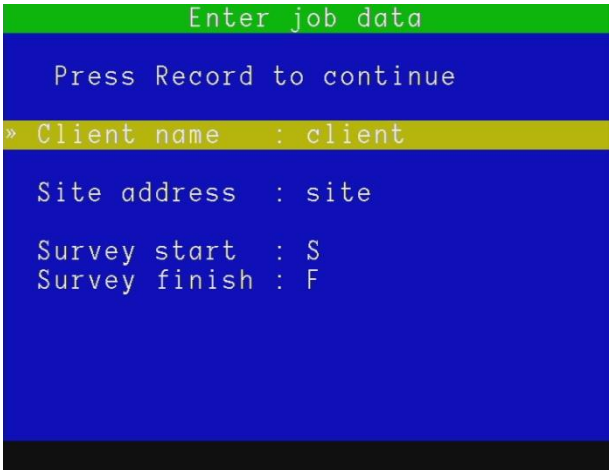
If the fault is such that you require further assistance from a service centre please make a note of the fault reported and how this developed. The system logs all issues in a file which can be found in the root of the memory card. The file is called Controller_Log.txt and it should be made available for reference to the service personnel.

4.5 Recording video

Recording video is easy. Insert a compatible memory storage device with enough free recording space for your survey.

⚠ CAUTION! Do not remove the memory storage device or switch the command module off during the recording process. Doing so may corrupt all data on the card and cause the command module to crash.

Figure 4.8: Enter job data window



To begin recording press ● (bottom left of the keypad buttons). Enter the Client, Site and Survey information using the keyboard and the **OK** button. Press ● again to start recording.

Connect the optional headset to record audio commentary over the video.

To pause a recording, press ‖. Press ‖ or ● to resume.

To end the recording, press ■ on the keypad or press **ESC** on the keyboard.

NOTE: Recordings are automatically limited to a maximum of approximately 2 hours. Recordings exceeding 2 hours will be split into multiple files.

Pearpoint recommends limiting recordings to a maximum of 30 minutes to optimize video post-processing on a computer.

For more information about digital video, please refer to the section “Digital Video”.

4.6 Taking pictures

You can save a digital screenshot at any time.

To take a screenshot press the button (the recording or playback will pause while the picture is saved).

The screen will display a “Please Wait” message to indicate that the picture is being saved followed by the file name.

Note: The picture taken will display exactly what is shown on the screen including any digital enhancements (zoom, pan or rotate). The on-screen display menu will not be shown.

4.7 Camera control (lights, focus, pan, rotate, zoom)

The P350 cameras have a range of features to help you locate faults in more demanding conditions.

Lights

All cameras feature LED floodlights to help illuminate pipes and conduits. LED brightness is controlled using the brightness controls on the keypad. Press ☼ or ☼ to change the brightness up or down.

If no auxiliary lighthead is used, press the brightness keys simultaneously to toggle the lights off or reset to last levels.

Auxiliary lighthead

If a lighthead is connected, simultaneously pressing the brightness keys will toggle the light controls between the following modes:

- Light control: ALL. Adjust both the camera and lighthead in series.
- Light Control: AUX. Adjust the lighthead only.
- Light control: CAMERA. Adjust the camera only. When selected, the light control mode will flash on-screen and fade.

Use the brightness keys to adjust the lighting level.

NOTE: When a lighthead is connected you cannot toggle the lights on and off using a simultaneous press of the brightness keys as this will change the control mode. To switch off the lights when a lighthead is connected, press the button until the lights are switched off.

⚠ WARNING! The camera and lighthead LEDs are very powerful. Do not look directly at the LEDs or point them at other people.

Focus

You can manually adjust the focus of P350 FW and PT cameras. Press **FN** and ☼ or ☼ .

The P350-CAM-PTZ camera features automatic focus. You can adjust the focus manually pressing **FN** and ☼ or ☼ . To resume automatic focus mode press **FN**, ☼ and ☼ simultaneously.

NOTE: the P350-CAM-FW and P350-CAM-PT have a focus range of 10mm (½") to infinity. The P350-CAM- PTZ has a focus range of 10mm (½") (WIDE) to infinity.

Pan

When using the P350-CAM-FW camera you can use the pan function to digitally pan a zoomed-in picture on screen.

To pan left or right, press **Fn** and or once to pan a fixed step in that direction.

Press simultaneously **Fn**, and to reset the digital pan. When using the P350-CAM-PT and P350-CAM-PTZ cameras you can pan from side to side, giving a wide field of vision without having to maneuver the whole crawler.

To pan left or right, press **Fn** and or once to start panning in that direction. Press either key again to stop the camera panning.

Alternatively, use the gamepad controls. This uses the right-hand joystick and are direct control in the direction of movement.

Tilt or rotate.

When using the P350-CAM-FW camera you can use the rotate function to digitally rotate the picture on screen.

Press or to digitally rotate the picture clockwise or anti-clockwise

Press the above simultaneously to reset the digital rotate.

The P350-CAM-PT and P350-CAM-PTZ cameras can rotate. When combined with the pan function, you can survey objects above and below the crawler.

To tilt/rotate the video on-screen clockwise press .

To tilt/rotate the video on-screen anti-clockwise press .

To stop rotating, press either key again.

Center

Press & together to reset the camera to the original central position.

Zoom

The P350-CAM-PTZ camera features a 10x optical zoom.

To zoom in on the camera's subject, press .

To zoom out from the camera's subject, press .

To reset the zoom, press the two buttons above simultaneously.

4.8 Digital Image effects (Pan, Tilt & Zoom)

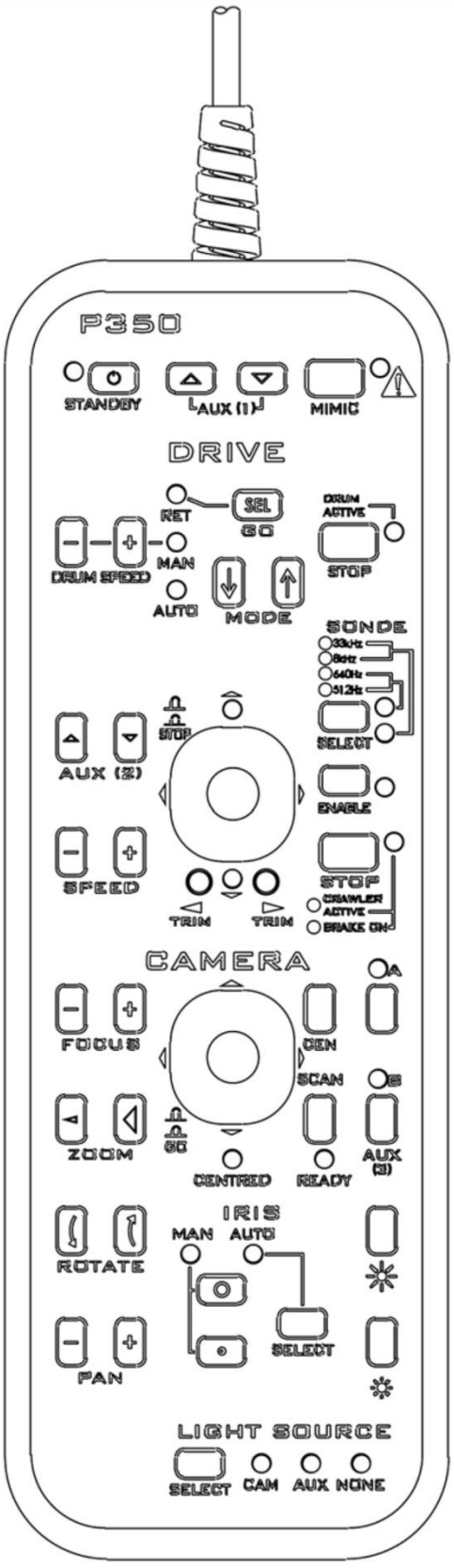
Digital pan, tilt and zoom features are provided for use with forward view and pushrod cameras.

Digital pan, tilt and zoom features can also be used on video playback.

4.9 Pendant controller

The P350 pendant controller is an optional accessory which allows the user to control the system remotely.

Figure 4.9: Pendant controller



Connections:

The P350 pendant lead connects to the Pendant socket on the powered drum or manual PSU.

NOTE: Do not connect or remove the pendant controller when the P350 system is turned on.

STANDBY

Start the pendant is enabled by pressing and holding the **[STANDBY]** key (top left). The'**ON**' light will turn green and the word '**pendant**' will appear on the controller display. The '**ON**' indication light will turn red when inactive.

NOTE: To prevent accidental operation of the P350 system, the P350 controller is disabled whilst the pendant is active. However, it is still possible to record.

Camera Controls:

PAN

Using these keys, the camera head can be moved left and right. This will depend upon the rotate position of the camera.

NOTE: On FW cameras, this is provided digitally instead.

ROTATE

Rotated clockwise and anti-clockwise.
NOTE: On FW cameras, this is provided digitally instead.

ZOOM

Zoom in **[+]** or Zoom Out **[-].**

NOTE: On FW/PT cameras, this is provided digitally instead.

FOCUS

To focus on distant objects, press **[+].** To

focus on near objects, press **[-].**

NOTE: Continuous pressing of either **[+]** or **[-]** key will result in 'wrap around' of camera focus i.e. in focus – out of focus – in focus

IRIS

On occasion, there may be a requirement for manual control of the iris to change the picture brightness (e.g. to reduce reflections from a shiny surface). Manually opening the iris to maximum aperture will allow more light to enter the camera giving a brighter picture. Closing the iris to the minimum aperture will decrease the amount of light entering the camera giving a darker picture.

1. Press the [**SELECT]** key until the '**MAN**' indication light comes on.

2. For a brighter picture, press the large '**O**' key for the maximum aperture (brighter picture).

3. For a darker picture, press the small '**o**' key for the minimum aperture (darker picture).

LIGHT SOURCE

The crawler lighting control allows the user to alternate and adjust intensity between camera lights, auxiliary lighthead (if available) and no lights.

1. To select lights, press the **[SELECT]** key until the required option is lit:
   a. To adjust camera lights, select '**CAM**'.

   b. To adjust auxiliary lights, select '**AUX**'.

   c. To adjust both lights, select '**CAM**' & '**AUX**' indication lights.

   d. To turn off all lights, select '**NONE**'

BRIGHTNESS

Use these keys to adjust camera and/or auxiliary lighting taking note which of the above options is selected.

To increase available light, press the large .

To decrease available light, press the small .

NOTE: With the auxiliary lighthead, when both '**CAM' & 'AUX'** are lit the large 'sun' key will ramp up the camera lights, then ramping the auxiliary lights.

SCAN

Pressing the **[SCAN]** key will cause the camera to centre, pan and roll 360° to scan the area. This will only work when the green '**READY**' indication light is lit.

NOTE: This function is not available for fixed forward view cameras.

AUX (1), AUX (2) & AUX (3)

The '**AUX**' keys currently have no function. These keys are for future expansion.

CEN

Press **[CEN]** key to centre the camera.

NOTE: This indication light will not illuminate whilst using fixed forward view cameras.

MIMIC

Toggles the Mimic display options.

JOYSTICK Control

Pan and tilt camera mimic is displayed when a pan & tilt camera is connected to the system. Pan and tilt camera mimic provides a 2D image of the 3D camera position. The square box acts as a target, use the pendant joystick to position it and press GO – the camera will move to this point.

NOTE: Joystick function is not available for fixed forward view cameras.

Drum & Crawler Controls:

STOP

Pressing the red **[STOP]** key will stop crawler motion and apply the brake. The **[STOP]** key will toggle the brake if the crawler is not in motion.

NOTE: When the crawler is active this indication light will be green.

SONDE

Press the **[SELECT]** key disables the sonde and selects one of the four available frequencies. Sonde frequency is shown.

Press **[ENABLE]** to activate the crawler sonde.

Press the **[ENABLE]** key a second time to toggle the sonde off and the indication light will turn off.

NOTE: The last selected sonde frequency will still be lit regardless of the sonde status as the sonde is only active if the amber indication light is on.

DRIVE

MODE: Pressing the [↑] or [↓] key changes the **MODE**:

(i) **MAN** (Manual). Allows full manual control of the crawler and drum using the [+] and [-] buttons.

To increase the drum pull speed, press drum speed **[-]**. To decrease the drum pull speed, press drum speed **[+]**.

NOTE: These keys allow control in '**MAN'** (manual) mode only. When selected, the '**MAN**' indication light will come on.

(ii) **AUTO** (Automatic). Selecting '**AUTO**' will allow the crawler to pull cable from the drum as it is driven forward. In reverse, the drum will pull at constant speed, providing the correct crawler wheel size has been entered into the controller,

NOTE: When selected, the '**AUTO**' indication light will illuminate. Whilst cable is being retrieved the '**DRUM ACTIVE'** indication light will illuminate green.

STOP

Pressing the red [**STOP**] key will stop the crawler and brake. If the crawler is already braking, pressing the [**STOP**] key will toggle the brake

SPEED

In manual mode, to increase the speed of the crawler, press [+]. To decrease the speed of the crawler, press [-].

JOYSTICK Control

Pushing the joystick upwards will increase the crawler's forward speed. A sustained push of the joystick will accelerate the crawler until it reaches its maximum speed.

Pulling the joystick backwards will slow the crawler's forward speed. A sustained pull of the joystick will slow the crawler until it stops.

AUTO (Auto mode): Continuous pulling of the joystick will result in crawler retrieval.

MAN (Manual mode): Continuous pulling of the joystick will drive the crawler backwards.

Pressing the [**STOP**] button on the joystick will stop all crawler motion and apply the brake. (it will also turn the indication light red.

NOTE: A green indication light will be shown for the direction the crawler is travelling i.e. forwards or backwards.

STEERING (P356 only)

Press left or right to steer while using the P356 crawler. The P356 can turn on the spot, or steer slightly while driving forward.

TRIM (P356 only)

This provides different offset speeds for the wheels on each side of the tractor. Can be useful when steering.

Pressing the left **TRIM** button while driving forward, the crawler will move to the left.
Pressing the right **TRIM** button will reduce the left trim. Pressing right again will cancel the trim

Trim may only be changed while the crawler is in motion. The crawler will retain its trim setting through power cycles and on other P350 systems.

Press both **[TRIM]** keys together and crawler will drive straight forward.

4.10 Removal of crawler from ducts

To return the crawler safely and securely, Pearpoint recommends using the accessory deployment tool.

Guide the crawler to an easily accessible position using the drive controls.

Prepare the grab, rods and clamp as described earlier.

⚠ CAUTION! Use a rope to lift the crawler.

1. Using the rope, lower the crawler grab tool and ensure the operating handle remains above the surface.
2. Secure the crawlers grab to the crawler's chassis (or elevator if used); this may take several attempts.
3. Lock the crawler grab using the toggle clamp.
4. Test that the connection is secure by lifting the crawler using the rope.
5. If the connection is secure, lift the crawler to the surface using the rope.
6. When the crawler is on the surface and in a secure location, disengage the clamp to release the crawler.
7. Disassemble the rods.
8. Clean and disinfect the crawler, rods and crawler grab as required.

Section 5 - Creating Reports

There are many ways to create a report; we aim to introduce a few options.

- Some customers just want a video, then take screenshots and add text using an office program manually. To do this just record video as described earlier. See the section 'One-touch recording' to turn off the reporting feature to speed this up.
- You can add text to the screen using the text page overlay. This can be enough for simple video surveys to add location information, crew members and a brief description of the problem.
- Use the built-in automatic Reporting software to make site observations for quick reporting later on.

5.1 Adding text to your video

During your survey you can choose to add on your video. Start recording using the recording button.

Press to enter the Text menu.

Figure 5.1: Text and Report menu

If this menu is opened during a recording, the video will pause while you type in your details. The recording will resume automatically when you complete your task and press **ENTER**.

Advanced

There are 20 editable text pages that can be used, these can also be set to display automatically at the beginning of your surveys.

- Large fonts: 13 rows x 36 characters
- Small fonts: 21 rows x 45 characters

NOTE: Take care when editing your text pages so that the resulting video recordings display all the information required when it is converted to a DVD.
Use the ▲and ▼ arrows, or **Page Up** and **Page Down** keys to browse.

To include any of these Text pages at the beginning of your survey Press **F4 TITLE.** Press **COLOR** or **TRANS** to change the color or transparency of the text overlay.

Press **F3 HIDE** to remove the current overlaid page and exit the Text menu.
NOTE: The page title is not recorded in the video in real time.

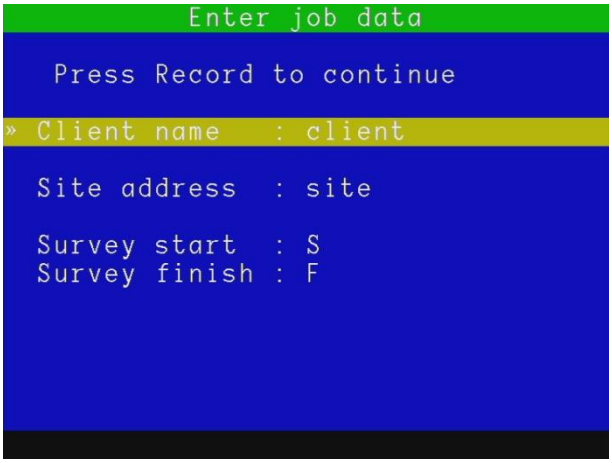
Press **F1 EDIT** to modify the text page. Use the keyboard or keypad to add or edit the text.

5.2 Creating Reports with observations

This is a very useful feature, allowing you to create videos, pictures and observations on-site. Load these automatically into our free Microsoft Word template report using our companion software FlexiSight Manager. This can reduce the number of office staff required by getting virtually all the work complete on site by one operative. Ensure you have set up your company details (Section 3.8 Company details Settings), then begin.

Pressing ● to record will show you the Enter job data window:

Figure 5.2 Enter job data window



Using the keyboard, **ENTER** and ▲and ▼ buttons, fill in your Client name, Site address and Survey start / finish locations.

Once complete, press the record ● button to continue recording.

The files will now be saved in a Client folder (to avoid having them all mixed together, as well as allowing the observations to be added).

You may have activated some Text pages to be shown as the introduction to your video. These will display and automatically hide.

You may encounter interesting defects along the way and wish to record a note of these. Pressing **ENTER** on the keyboard to log an Observation to the survey.

Observation fields:

1. **Video**: File name. This is filled automatically.
2. **Video Time**: Video time reference. This is filled automatically.
3. **Photo**: Press **OK** to add a saved picture to your observation (browse files for pictures of the defect). See next page.
4. **Distance**: Counter distance value This is filled automatically.
5. **Cont. Defect**: A defect which extends further than 1m from your current position.
6. **Code**: Defect Code. Select from the WRC defect codes, the PACP or create your own custom codes using Flexisight Manager.
7. **Joint**: Note if the defect relates to a pipe joint.
8. **Material**: Pipe's material; choose between WRCs MSSC 3 pipe materials ID (by default).
9. **Band**: Medium or large. This is associated to specific WRC codes.
10. **Dimension 1**: Pipe dimension 1 associated to the defect code entered (10 characters).
11. **Dimension 2**: Pipe dimension 2 associated to the defect code entered (10 characters).
12. **%**: Defect code Percentage value.
13. **Clock at/from**: Defect position.
14. **Clock to**: Defect position.

15. **Remarks**: General remarks (30 characters maximum).

16. **Grade**: Grade the severity of your defect from 1-5 as per industry standard definitions.

Adding a photo to an observation.

In the Photo field, press **OK**. Select the photo in the browser screen and select **SHOW** to view, select USE to attach the photo, or **BROWS** to return to the browser**.** Press ◄ or **ESC** to exit.

NOTE: An error message will appear if the picture is not suitable. This may happen if you are trying to use an incompatible photo.

Observation popup

When entering observations, you can set up the controller to display (popup), if recording, the observation you have just entered automatically in the middle of the screen for duration of 4 seconds when resuming your survey.

Defect code list

By default the P350 controller uses the WRC MSCC 3 Condition Codes. The Condition Codes list is also available to browse and use when you edit text pages.

You can change the built-in defect code list, for example by replacing it with the PACP defect code list, or create and customize it to better suit your specific needs. See the Appendix for more details on how to do this by using FlexiSight Manager and transferring the memory card files to your computer.

Structure

The system stores reports in folders arranged by Client, site and survey. See Figure Default JOBS Structure. This helps to keep work separate when working on many sites. By default, file names will be stored in the format: S_F_110129_1200

This identifies a survey done at 12:00 on 29-January-2011.

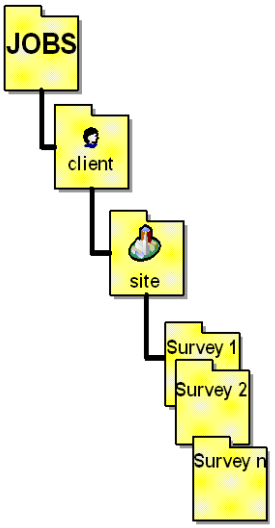


Figure 5.3: "Default" JOBS Structure

Editing Client, Site or Survey details

After completing a site, you may wish to add extra information to your survey. From the main display window, press **MENU > JOBS** and scroll down to the survey recently created. Press OK, scroll to Client, Site or Survey, press OK again and you will find the extra information fields.

Client fields

1. **Name**: Client's company name or personal name if the client is an individual (30 characters).
2. **Client reference**: Client's reference (30 characters).
3. **Address**: Client's address if different from the site address (30 characters).
4. **Town**: Client's town name (30 characters).
5. **State/County**: Client's state/county location (30 characters).
6. **ZIP/Postcode**: Client's ZIP/Postcode (10 characters).
7. **Telephone**: Telephone number (20 characters).

8. **Email**: Email address (30 characters).

Site fields

1. **Address**: Address of the site under survey (30 characters).
2. **Town**: Site's town name (30 characters).
3. **State/County**: Site's state/county location (30 characters).
4. **ZIP/Postcode**: Site's ZIP/Postcode (10 characters).
5. **Telephone**: Telephone number (20 characters).
6. **Email**: Email address (30 characters).
7. **Contact**: Name of the site's contact (30 characters).
8. **Site Reference**: Site's reference (30 characters).

Survey fields

1. **Start**: Survey starting point (7 characters).
2. **Finish**: Survey finishing point (7 characters).
3. **Date**: Date the survey took place (10 characters).
4. **Time**: Time the survey took place (10 characters).
5. **Job Reference**: Job's reference (30 characters).
6. **Crew**: Crew or operator name (30 characters).
7. **Direction**: Survey direction; choose between upstream or downstream.
8. **Survey Length**: Length surveyed (30 characters).
9. **Pipe Height**: Pipe's height (30 characters).
10. **Pipe Width**: Pipe's width (30 characters).
11. **Material**: Pipe's material; choose between WRCs MSSC 3 pipe materials identification.
12. **Use**: Choose between WRCs MSSC 3 pipe use identification.
13. **Size**: Choose between WRCs MSSC 3 size identification.
14. **Shape**: Choose between WRCs MSSC 3 shape identification.
15. **Lining**: Choose between WRCs MSSC 3 lining identification.
16. **Water Level %**: Water level in %.
17. **Purpose**: Choose between WRCs MSSC 3 survey scope identification.
18. **Weather**: Choose between WRCs MSSC 3 weather identification.
19. **Remark**: Remarks (30 characters).

By default the P350 controller is compatible with the WRC MSCC 3 specifications and as such it contains WRC Condition Codes and can export SEWER.DAT report files.

You can however modify the defect code used when entering your observations and customize the client, site, survey and company forms and result in a report template which is compatible with alternative condition codes.

5.3 HTML Reports

A legacy feature. A HTML web document is created for quick reporting uses.

HTML reports are compatible with most web browsers. You can view or print HTML reports using a computer, by accessing the report.html file in the report folder for any survey on the storage device.

To create an HTML report, go to the Job Reviewer, move the cursor to the bottom half of the screen and press **REPRT**.

HTML reports can be given directly to the customer: from the JOBS folder simply copy the “Report” folder to a destination of your choice.

Folder structure

The report is generated as a series of HTML documents. These are organized into a series of sub-folders. The principle is similar to that of an internet website.

Reports documents are organized as follows:

[report] This folder can be found in the survey folder (once you have created a report) and contains all the files necessary for an html report.

- **report.html** is the main page of the report. Access the report using this file.
- **logo.jpg** is your company or business logo. This is the logo entered with your Company details.
- [**pages**] folder contains individual HTML pages.
- **[data]** folder contains a copy of the job data at the time the report was created.
- **[images]** folder contains images for any observations that may have been made.

NOTE: Please copy or move the entire Report folder (including all sub-folders) to your computer when retrieving the html report from the storage device.

⚠ CAUTION! Do not edit any files directly with a text editor or word processor as this may corrupt the report or render it unreadable to FlexiSight Manager

Browsing and printing

Figure 5.4: Viewing reports in a web browser

1. Connect the memory storage device to your PC

2. Once your computer recognizes the controller, use Windows Explorer to locate the survey folder.

3. You can then copy or move the report folder to your computer or view it directly from your memory storage device.

4. Using Windows Explorer locate the report.html file in the report folder.

5. Open “report.html” with a web browser.

6. If prompted, allow Active Content by right-clicking the yellow warning bar at the top of the screen and select the ‘Allow Active Content’ option.

Figure 5.5: Navigation Frame

The report will load and display the navigation frame on the left and the title page on the right.

To assist navigation, the report is presented in a similar fashion to a web site or a PDF document with bookmarks, see Figure 9.6.

The report is divided into two frames:

- The navigation frame on the left displays a link to each page and a print link that prints the currently displayed page.

- The content frame on the right displays the currently selected report page.

To print a page, select it using the links on the navigation frame and then press the Print This Page link. You must repeat this step for each page of the report.

NOTE: Use the Print This Page link rather than using the File -> Print command, otherwise the printed page will also include the navigation frame and be printed in landscape format.

5.4 One-Touch Recording

To disable the JOBS information fields and progress directly to recording video, go to **MENU > SETUP > CONTROLLER > BASIC SETTINGS > JOB PROMPT.** Setting this to OFF will stop the JOBS information screen popping up when you first press **Record**.

In this case the P350 will default to “client”,“site”, and “S_F” as references for the folder structures.

Section 6 - Reviewing your work: The Job Browser

6.1 The Job Browser Window

When you have completed your survey, from the main display, press **MENU > JOBS** to review your jobs.

This menu screen is organized into three areas.

- **Job details**: This shows the client, site and survey details of the job selected in the jobs list.
- **Jobs list**: This is the list, in order, of all the jobs stored in your memory card. The letter “A” denotes that a job is active.
- **Menu bar**: Bottom of screen. This shows all the available commands.

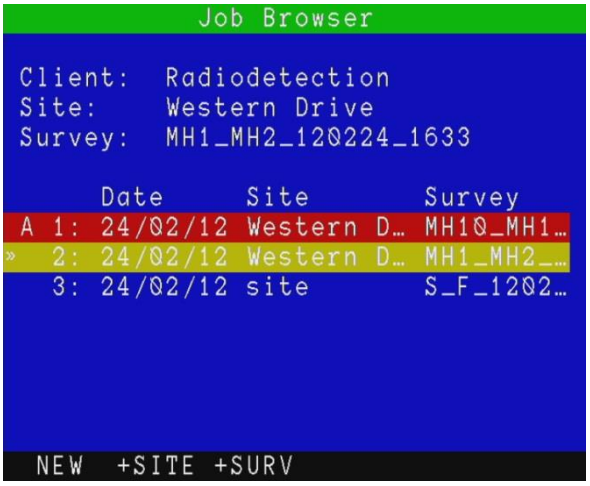


Figure 6.1 Job browser menu

Use the Job Browser to review all the jobs present in your storage device, see which job is active, create a new job, resume an existing one and add a site or survey to an existing job.

1. Use the arrow keys, **Page Up**, **Page Dn**, **Home** and **End** to browse the Jobs list. You can also navigate by keying the job number.
2. Press **OK** or ► to review the selected job by entering the Job Reviewer screen.

There are three commands available which will all take you to the Job Reviewer screen to perform a different function:

- **NEW**: Create a new job.
- **+SITE**: Add a site to the selected job (client).
- **+SURV**: Add a survey to the selected job (site).

6.2 The Job Reviewer Window

The Job Reviewer window, is the menu that allows creating, editing or reviewing a job client, site and survey data. It also allows reviewing quickly all the files associated with the selected job.

The Job Reviewer screen is divided into 3 areas:

- **Job details**: This shows client, site and survey details.
- **File browser**: This shows all the files associated with the job.
- **Menu bar**: This shows all the available commands.

NOTE: The available commands in the menu bar will change depending if you are reviewing Job’s details or if you are in the file browser area.

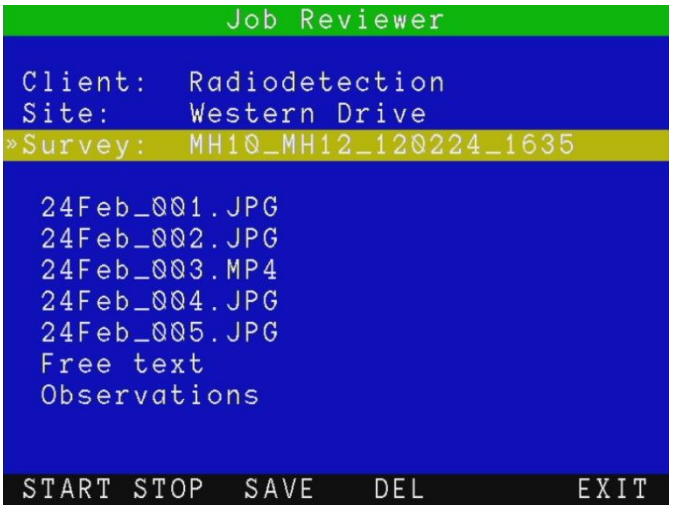


Figure 6.2: Job Reviewer Menu

The filenames can be set to be recorded using either the date, survey, site or client information. See the Controller Settings section.

There are 6 commands available:

1. **START*:*** Activates the current job and exits to the main screen with live video. If pressed when defining a new job it also saves the details entered so far.
2. **STOP**: De-activates the job (if active) and return to the Job Browser menu.
3. **SAVE**: Saves details you have entered or edited. This command is only available when selecting a job's detail.
4. **DEL**: Deletes the job's details or file selected.
5. **SEWER**: Creates a **SEWER.DAT** (MSCC 3) report file. This command is only available when selecting a job file and providing that the controller's Job template it has not been customized.
6. **EXIT**: Exit and returns to the Job Browser menu. A warning message will appear if you are exiting without having saved your changes.

Job details can be copied to a text page, which can then be recorded in a video. In order to do that, select client, site or survey, and press on the keypad. A text page selector will be displayed, as shown on Figure 9.6. Select the page you wish to use with the keys, and press **COPY**.

NOTE: the previous content of the page will be overwritten.

Figure 6.3: Text Copy screen

Active Jobs

To activate a job, press **START**. All recordings and observations will be saved in the active's job survey folder.

The current active jobs is identified by the letter "**A**" in the Job Browser menu.

To de-activate a Job, press **STOP**.

Section 7 - The FILES Browser

7.1 General operations

The **MENU > FILES** menu allows you to view the current default directory, access reports and check the card status.

Figure 7.1: FILES Browser window

Folders are organized by Client, Site then Survey. Memory card size and free space is displayed as well as the folder address.

Use the ▲ and ▼ arrows to select the file or folder. Pressing **OK** on the **[..]** line takes you back up the folder tree to find higher up folders.

COPY:

To copy a file or folder, press **COPY,** navigate to the destination location and press **PASTE** on the controller.

MOVE

As above, the **MOVE** feature will permanently transfer a file to a new location.

To rename a folder:

Select a file or using the ▲ & ▼arrows. Press **RENAM**, the file name will appear near the bottom of the screen. Type a new name and press **OK** to confirm **CANCL** to cancel the operation).

SEND

Use this function to send files via Bluetooth (to compatible devices).

Press **SCAN** to search for nearby Bluetooth devices. **KNOWN** to search previously used devices. Ensure your device is active and searchable. Press **PAIR** to sync devices, you may need to enter a pass-code and accept the file transfer. Folders cannot currently be sent via Bluetooth. Follow the on-screen instructions.

Deleting files and folders

You can delete any file or folder on the storage device..

1. Select the file or folder you wish to delete.
2. Press the ► arrow to mark the file for deleting.
3. Repeat the previous two steps if you wish to delete multiple files or folders.
4. Alternatively, press **+ALL** to mark all the files and folders included in the current folder or **-ALL** to deselect them all.

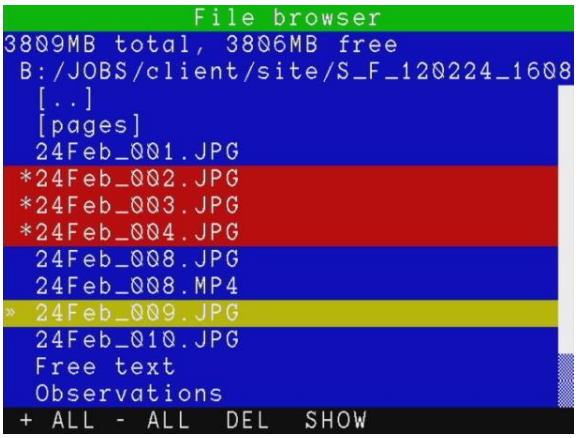


Figure 7.2: File browser delete and show screen

5. Press **DEL**, select **YES** to confirm the delete operation or **NO** to cancel.

⚠ CAUTION! This operation will delete user files. It cannot be undone!

NOTE: You can also use the Delete button on the keyboard.

Creating folders

Create new folders in any location on your storage device. Enter the folder where you wish to create the new subfolder. Press **DIR**, type in the new folder name and press **OK**.

Once the folder is created you can move or copy files to it as with any folder on the storage device.

Information

To access file and folders information:

Select the file or folder and press **INFO** to access the information:

- File Extension or Folder.
- File Size.
- Read-only attribute.
- Hidden attribute.
- Date and time of creation.

Press **OK** to exit.

Viewing JPEG pictures

The file browser allows viewing of JPEG image files created by the P350 controller. When a picture is displayed on-screen a camera symbol will appear on the top right, where the record button usually displays.

NOTE: JPEG pictures not created by the P350 system may not be compatible with the controller. Only pictures with horizontal and vertical pixels in multiples of 16 will work. For example, pictures with dimensions of 720x480 pixels will work, but those with 800x600 pixels will not.

To view a JPEG file:

Select a JPG file. Press **OK**, **Enter** or video ► to display the picture on-screen.

Press ▼or ▲ to view any other JPEGs stored in the folder.

Press ■ or ◄ to return to the file browser.

To view multiple JPEG files:

You can select more than one file to restrict your browsing to the selected ones.

Select a **JPG** file, mark the file by pressing the ► arrow key. Repeat the previous two steps for every JPEG file you wish to view or press **+ ALL** or **-ALL** to select or deselect all the files present in the folder. Press **SHOW**. Use the ▲and ▼ arrows to scroll through your selected images.

Press ■ or ◄ to return to the file browser.

Viewing slideshows:

You can display a slideshow of all pictures contained in the folder or of the multiple pictures you have selected:

Press **SSHOW**. Use the ▲and ▼ arrows to select your preferred transition time (3 to 20 Sec).

Press **OK** to confirm your choice and start the slideshow.

Press ■ to stop the slideshow.

Playing videos

You can play a recorded video and view it on the P350 display, or on any external monitor connected to the video output jacks on the controller.

NOTE: If using an external monitor to display the video, this may not display the entire picture as shown and recorded by the P350. The size of the picture displayed will vary between monitors and it is dependent on the monitor's analog input and video resolution specifications.

To playback a video:

Select the file you wish to playback. Press video ► or **OK** to start the playback.

Press ▯▯ to pause the video at any time.

Press ◄ and ► and to fast-forward or rewind. To resume normal playback speed press video ►.

Press **VOL-** and **VOL+** to adjust the audio volume.

Press **|<<** or **>>|** to jump to the previous or next photo or observation marker.

Press ■ or **OK** to stop the playback and go back to the file browser.

NOTE: With 'Tab Menu Timeout' enabled, the Playback OSD will fade from view after a few seconds.

The digital imaging controls of the Controller also work when playing video. Zoom, rotate or pan the picture on screen.

⚠CAUTION! Do not remove the memory storage device, or switch the controller off during the playback process. Doing so may corrupt all data on the storage device and cause the controller to crash.

Screen captures

During playback it is possible to capture video frames as JPEG photos.

NOTE: You can view folders created by the P350 flexitrax in Windows Explorer or the Mac OS X Finder when you connect the command module to your computer via USB connection (see Section 6.6 for information on USB connections). The P350 card browser will only display compatible files: JPEG, MP4, TXT, BIN and HTML. BIN and HTML files are listed only and cannot be viewed on the command module.

TXT files can only be viewed if smaller than 1Mbyte.

Viewing Pitch Log

The file browser allows you to view pitch log files created by the P350 system.

NOTE: Pitch log TXT files can only be viewed if smaller than 1Mbyte. Larger files will have to be opened using a PC.

To view a pitch log file:

1. Select a TXT file using the ▲ and ▼ arrows.
2. Press **OK** or **Enter** to display the log file on-screen.
3. Press ▲ or ▼ or **Page Up or Page Down** to scroll through the data.
4. Press **OK** to close the file.

7.2 USB connections

The P350 command module supports USB 2.0 to allow high speed files transfer. USB is the recommended method for transferring files between the command module and your computer.

NOTE: The command module is compatible with high-speed, powered USB ports. Connection to external USB hubs or older version 1.1 USB ports is not recommended.

To connect via USB:

NOTE: Only use USB 2.0 graded cable to connect the command module to your computer. example E, and will be listed in the My Computer window.

1. Switch the command module off for the duration of the connection. The integrated card reader will draw sufficient power from your PC USB hub.

2. Ensure your computer is switched on and running.

3. Connect the supplied USB cable to the unit and to a free USB port on your computer. Do not use an external USB hub.

4. On Microsoft Windows-based computers, the command module will appear as a Mass Storage Device. It will be assigned with a drive letter, for example E, and will be listed in the My Computer window.

5. On Apple Macintosh computers, the card will appear as an icon on the desktop and as a source disk in the sources list on any Finder window.

6. After your computer has mounted the card, open it in Windows Explorer or Finder and then open the DVC folder to retrieve your inspection files.

Disconnecting

⚠CAUTION! The command module must be properly ejected from your computer BEFORE you disconnect the USB cable. Failure to do so may corrupt your card and all data.

Windows

To disconnect the command module from your computer you must use the Windows USB hub manager before removing the cable. To do so:

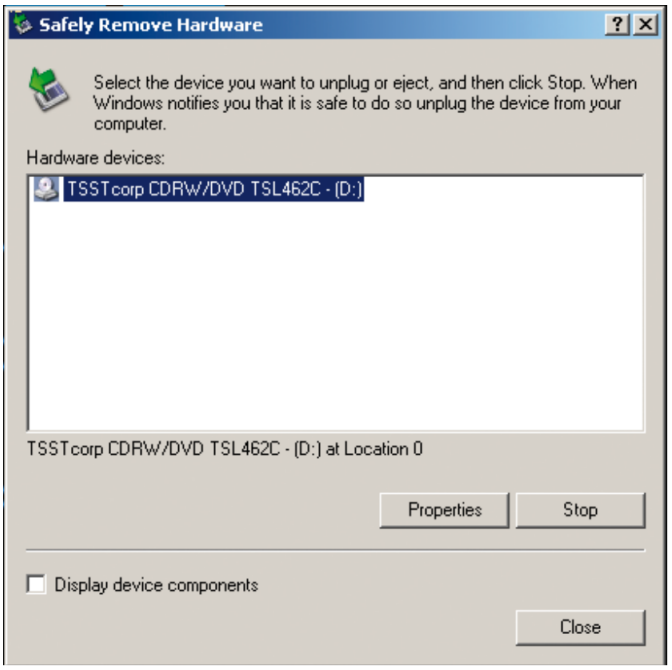
1. Locate the USB device icon on the Windows Task Bar (usually bottom right-hand corner of the screen). When you hover your mouse cursor over this icon, a tool tip Safely Remove Hardware will appear.

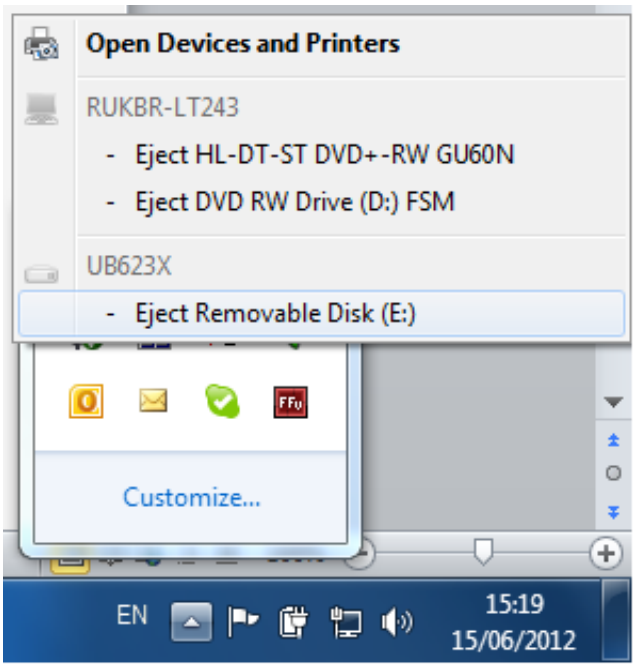
2. Left-click the icon with your mouse and click the option to remove the command module.

3. A balloon popup will inform you that it is safe to remove your hardware.

4. You can now disconnect the USB cable from the computer and command module.

Figure 7.3: Examples of Windows USB hub manager windows


Safely Remove Hardware
Select the device you want to unplug or eject, and then click Stop. When Windows notifies you that it is safe to do so unplug the device from your computer.
Hardware devices:
TSSTcorp CDRW/DVD TSL462C - (D:)
TSSTcorp CDRW/DVD TSL462C - (D:) at Location 0
Properties
Stop
Display device components
Close



1. Switch the command module off for the duration of the connection. The integrated card reader will draw sufficient power from your PC USB hub.
2. Ensure your computer is switched on and running.
3. Connect the supplied USB cable to the unit and to a USB port on your PC. Do not use an external USB hub.
4. On Microsoft Windows-based computers, the command module will appear as a Mass Storage Device. It will be assigned with a drive letter, for example E, and will be listed in the My Computer window.

Section 8 - Digital Video

The P350 flexitrax includes an advanced digital video recorder. This section provides an overview of the P350 flexitrax digital video recording and playback capabilities. Also included is a detailed section on converting video files to other popular formats for playback and distribution.

The P350 flexitrax system produces high-quality digital video files encoded with H.264 video and AAC audio CODECs. The resulting files have an MP4 extension.

Many video settings can be changed to suit your needs, check the Controller Settings section for further details.

8.1 Video Input options

The P350 flexitrax features several advanced video settings. You can for example, change the default destination and file names for recorded videos. You can also choose to include a title page on the start of each video.

Video Input

MENU > SETUP > BASIC SETTINGS > VIDEO SOURCE.

There are 3 choices: **Auto, Camera and External**. The default setting is **Auto.**

1. Use ▲ and ▼ to select your choice.
2. Press **OK** to confirm or ◄ to return to the settings menu.

The Auto setting gives preference to the external video source (if present).

The Camera setting selects the P350 camera as the default video source.

The External setting selects the external video source. You can connect an external video source to the command module using standard composite RCA or BNC cables as required.

The command module's video input jack is located inside the I/O interface panel and is highlighted with a yellow ring around the jack.

⚠ CAUTION! Only one external video source should be connected at any time or the system will not work correctly.

8.2 Video playback

You can play recorded video using the command module or any computer system that has compatible video playback software and CODECs installed.

Command module playback

Video playback using the command module is described in Section 7.

Computer playback

Videos can be transferred and played on any compatible computer that features the following:

- Correctly installed video and audio CODECs and a compatible video player program.

Or

- A compatible video player program with integrated H.264 and AAC CODECs.

VLC (from the Videolan project) or Quicktime (from Apple) support files created with the P350 command module. Both VLC and Quicktime do not require additional CODECs and are available free for Microsoft Windows XP, Vista, 7, 8, Mac OS X and most Linux distributions (VLC only).

VLC media player is available on line from the VideoLan project website.

Quicktime media player is available on line from the Apple website.

NOTE: VLC contains the libdvdcss software library, which may be prohibited for use in your country. Note however that libdvdcss is not required to play videos recorded by the P350 flexitrax. Please seek appropriate legal advice before downloading and using VLC

Playback on Microsoft Windows Media Player

By default, Microsoft Windows Media Player cannot play the MP4 video files created by the P350 system as it requires additional video and audio CODECs to be installed.

You can install the correct CODECs for playback on Microsoft Windows XP, Vista, 7 or 8 by installing FlexiSight. Once installed, you can play the files using Windows Media Player.

CAUTION: FlexiSight Manager uses professional video and audio CODECs which are licensed for one concurrent installation only. It is illegal to install FlexiSight Manager on more than one computer at any time or to copy or distribute it.

Your computer may already have third party H264 and AAC CODECs installed. While these may enable playback using Windows Media Player (or other playback software) they may inadvertently affect the performance of FlexiSight Manager and your computer.

This is known as CODEC conflict. CODEC conflict may cause your video program or your entire system to become unstable or even crash. If you suspect a CODEC conflict has occurred, uninstall FlexiSight and all third party H.264 and AAC CODECs then reinstall FlexiSight.

CODEC conflicts can be troubleshot using a number of online free tools. Tools like GSPOT or Sherlock: The Codec Detective will allow you to see which CODECs you have installed on your PC and if they can play MP4 H264/AAC) files.

Alternatively use a dedicated videoplayer that supports H.264/AAC files.

Figure 8.1: Video playback on Windows XP using VLC media player

8.3 Distributing your recordings

When it comes to distributing your recordings the first thing to consider is your customer's requirements.

Generally speaking there are two possibilities: they may require a DVD or a digital video file.

- DVDs are one of the most popular ways to distribute videos. Domestic DVD players are found in most households and modern PCs are equipped with a DVD player.

- Digital video files are quickly becoming very popular as they can be easily edited and digitally stored on company servers. More advanced DVD players can also play some video files. Digital video files can be distributed on CDs, DVDs, flash memory or even electronically via the internet.

Once you decide on the distribution media you must know if they will play their video (DVD or digital file) on a television or a PC.

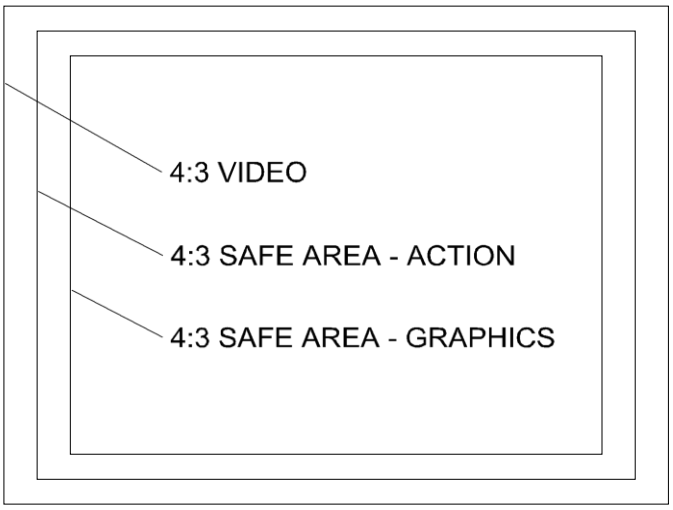
Most televisions, even modern displays, and standalone DVD players and recorders are designed for standard broadcasting. As such they may be unable to display or record the video produced by the P350 command module correctly. This is because the P350 makes use of the entire 4:3 video picture available, whereas standard broadcasts usually do not.

NOTE: 4:3 refers to the standard aspect ratio of PAL and NTSC broadcasts priors to the advent of standard and high definition widescreen broadcasts.

Depending on overscan (the ability to display the entire 4:3 picture space), different TVs and DVD players will show different video sizes varying between the full 4:3 picture and the broadcasting Graphics safe areas.

The 4:3 Action Safe area is defined to be between 3.3% and 3.5% smaller than the 4:3 full video size. The 4:3 Graphics Safe area is defined to be between 5% and 6.7% smaller than the 4:3 full video size. This is illustrated below:

Figure 8.2: 4:3 aspect ratio video space usage



The P350 Command Module offers a number of different OSD and text layouts that will optimize your video recordings and analog video output signals to suit your desired target audience.

Setting the P350 for PC or TV screen:

To produce a DVD or digital video file recording to be played on a TV screen set your OSD layout to TV layout.

To produce a DVD or digital video file recording to be played on a PC screen set you OSD layout to Normal layout.

See Section 3 Command Module and System setup for more information on how to set OSD layouts.

Producing a DVD video

The quickest ways to produce a DVD disc from a P350 recording are:

- using a DVD recorder

or

- using a PC or Mac computer.

Using a DVD recorder

If you have a domestic DVD recorder with composite video inputs, you can copy the video direct to a blank DVD using the following procedure:

1. Ensure you have recorded your survey with the OSD set to TV layout.
2. Connect any of the P350 flexitrax video outputs to your DVD recorder's video input sockets using a suitable composite video cable.
3. Switch on the command module and locate the file you wish to convert using the file browser. Do not play the file at this stage.
4. Insert a blank DVD into the DVD recorder and begin recording.
5. Play the file on the command module.

NOTE: if your recordings were not set to TV mode use the digital zoom function on the command module to match the P350 video picture size to the one captured by your DVD recorder and displayed by your TV.

1. When the file is finished playing, stop the DVD writer and, if required, finalize the DVD disc following the DVD recorder's user documentation.

Using a PC or Mac computer

To produce a video DVD using a PC or Mac you will need a computer equipped with a DVD burner and a compatible authoring program.

Nero 8 or later and Xilisoft's DVD Creator supports H264/ AAC recordings for Windows based PCs. Roxio Toast is a similar product available for Mac Users.

These programs feature easy-to-use wizards that guide you through the conversion and burning process.

To produce your DVD just select the MP4 recording that you want to convert and select the DVD Video creation function.

NOTE: You will have to set the OSD layout to TV before recording your survey in order to ensure that resulting DVD will play on a TV.

Supported digital video files

H264/AAC MP4 files

The flexitrax system creates MP4 files which are encoded in H.264 for the video and AAC for the audio.

If you decide to distribute MP4 files created with the flexitrax system you must ensure that your customer is able to play the files on his computer. To do this your customer must have the right CODECs installed or a dedicated digital video player that supports both CODECs.

Alternatively you may distribute (subject to licensing) a suitable third-party media player or the relevant CODECS with your recordings.

MP42/WMA2 AVI files

Your customer may require a different file format. The most commonly used is an AVI file encoded in MP4 for the video and WMA2 for the audio. AVI files encoded in this way are usually supported by Windows without the need of any additional CODECs.

You can create such a file by using FlexiSight Manager, if installed on a Windows PC. Just open the original MP4 file and save it as an AVI file by selecting the file type required in the "save as" dialog box.

Please note that FlexiSight Manager will re-encode the original video. The operation will take some time and the resulting video quality will be inferior to the original file. The length of the final file may also be much larger depending on the complexity of the video.

Unsupported digital video files

⚠ CAUTION! Producing formats other than those described are not supported by Pearpoint. The information here is intended as a general guide only.

In order to produce a different video digital file you will have to use a video conversion application to re-encode your file.

Video conversion software gives considerable control over many video properties, allowing you to create files that can suit your requirements.

On Microsoft Windows systems, third-party applications like the “Ultimate video converter” offered by Xilisoft (commercial) or Super© (free), both available on the web, can convert MP4 files into many other digital video formats (we do not officially support or endorse these products).

DivX and Xvid AVI files

A popular file format supported by many newer DVD players and many portable digital players is DivX. You can re-encode files in AVI DivX by using suitable video converter.

DivX CODECs for Windows and Mac are available to download freely for personal use.

Xvid is an open -source implementation of the DivX CODEC. Most Xvid encoded files will play on a DivX certified player.

The advantages of this format are:

- Good quality at reduced file size.
- Wide playability with digital media players and some domestic DVD players.
- Does not require a DVD or CD burner to produce. The disadvantages of this format are:
- Encoding process can take longer than other formats.
- Requires a suitable CODEC or a compatible media player to play on computers.

QuickTime MOV files

The QuickTime format is based on a similar H.264 CODEC as the native P350 video format, thus it enjoys the same quality to file size ratio. The QuickTime format is playable on PC and Mac computers using Apple's QuickTime media player.

The advantages of this format are:

- Good file size to quality ratio.
- Preferred video file format for Apple Mac computers.
- Playable on Apple's range of personal media players and smartphones.
- Is suitable for embedding in web pages for distribution on the internet.
- Does not require a DVD or CD burner to produce.

The disadvantages of this format are:

- Encoding process can take up to three times longer than other formats.
- Requires QuickTime or the VLC media player for playback on a computer.
- Is not playable on domestic DVD players.

Using data CDs, DVD & USB flash drives

You can copy any digital video file on to a standard,
blank data DVD or CD using any burning program that is compatible with your computer.

NOTE: If using an Apple Mac, be sure that you encode your DVD using the Joliet file system for maximum compatibility with Windows-based computers. Windows cannot read DVDs encoded with the native Mac HFS file system.

Alternatively you can distribute your video files using a standard USB memory stick. These devices are inexpensive and can offer storage capacities greater than DVDs. These devices are simple to use and do not require the use of a DVD or CD burner only a free USB port on your computer.

NOTE: For maximum compatibility between computers and other devices, ensure your USB memory stick is encoded using the FAT32 file system. Individual files stored on FAT32 formatted drives must not exceed 4GB in size; the total of all file sizes may be greater than 4GB.

8.4 Converting digital videos

⚠CAUTION!: Producing formats other than those described is not supported by Pearpoint. The information here is intended as a general guide only.

Digital conversion requires the use of a computer to convert the video files from their native format to another digital file format.

Using this method you can convert video files to almost any format you require, for example.

Conversion software for Windows

Ultimate Video Converter

The Ultimate Video Converter is a commercial utility that can convert video files using internal CODECs. The Ultimate Video Converter is available for purchase for Windows and Mac computers from the xilisoft web site. The Ultimate Video Converter can convert P350 video recordings into the following formats:

DivX, Xvid, VCD, MPEG1, QuickTime, Flash Video (FLV), Windows Media Video (WMV), MPEG1, MPEG2, MPEG4, VCD, SVCD, DVD.

Windows Super ©

Super © is a freeware utility for Microsoft Windows XP, Vista, 7 that can convert video files using internally bundled CODECs. Super © is available for download from the erightsoft website.

System requirements

Below is a list of recommended minimum specifications for converting and editing digital video files on Windows and Apple Mac computers.

- Windows XP, Vista, 7 and 8.
- An Intel Pentium 4 or AMD Athlon 64 processor or higher.
- 512MB of RAM (1GB if using Windows Vista, 7 or 8).
- CD or DVD burner (for producing DVDs, VCDs or distributing video files on optical media). • •

8.5 Advanced video editing

FlexiSight Manager

FlexiSight Manager is a Pearpoint PC application that can perform basic editing on P350 video files and survey reporting. This program is compatible with Windows XP, Vista, Windows 7 and Windows 8. Operators will likely require “administrator” rights to install the software.

FlexiSight Manager allows editing of reports, videos, observations and pictures. With FlexiSight you can take and annotate snapshots, add observations and defect codes, delete footage and merge clips. For more information on using FlexiSight Manager, please refer to the FlexiSight Manager user guide.

The basic FlexiSight Manager software is provided with one free license for every system purchased. Advanced users can upgrade to our paid extension module, which offers pipe profile mapping graphics that can be easily inserted into a Microsoft Word-based survey report. This allows the mapping of underground pipes and passages to determine whether utility gradients are adequate for flow. See figure 4.3a.

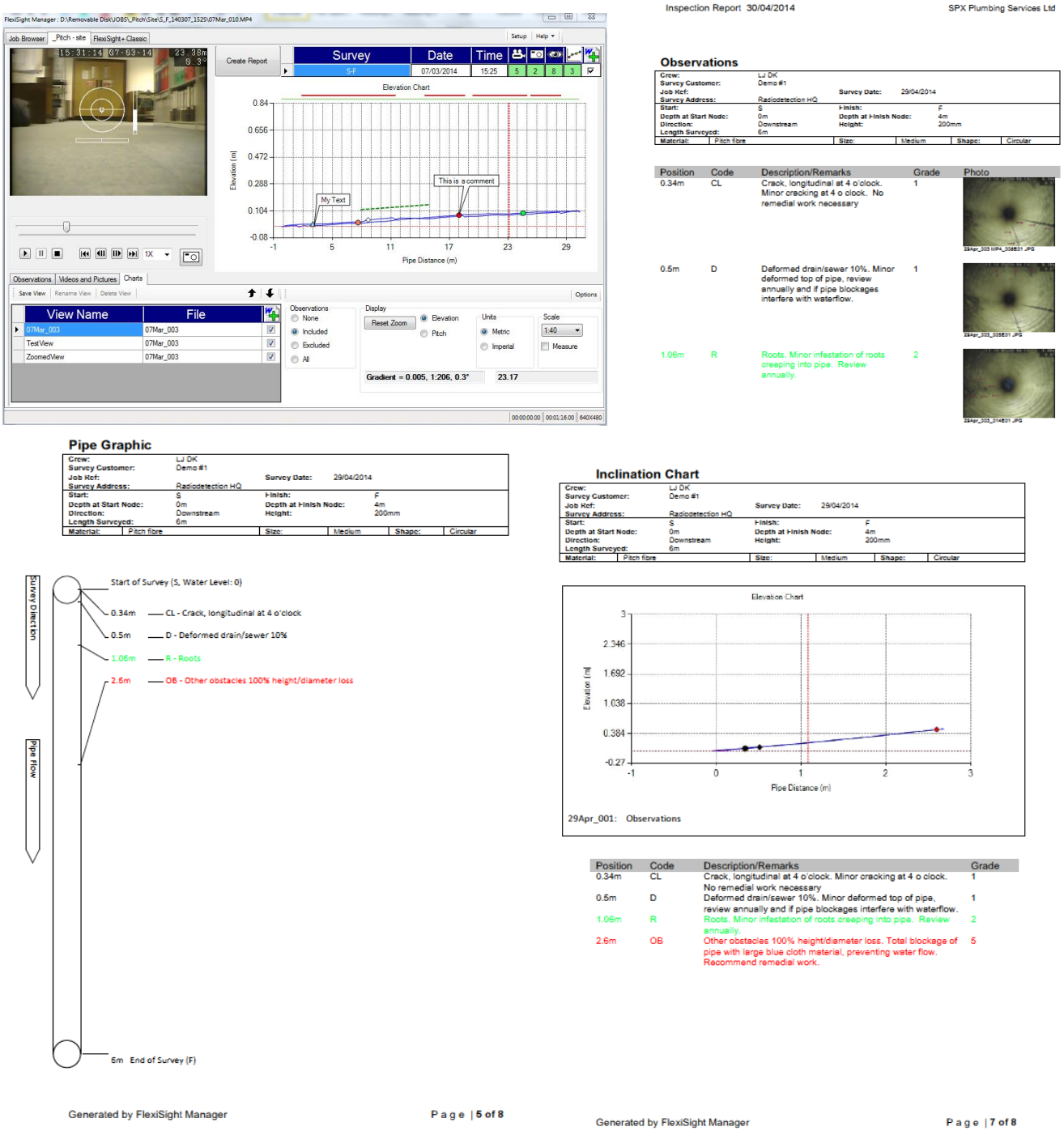


Figure 4.3a The FlexiSight Manager software - Pitch profile and Report Template example

The resulting Word document can be used as a convenient and professional looking survey that can be created in 5 minutes (content depends on information entered during the survey). The end result can also be edited in Microsoft Word to include additional details, contact advice and a company logo.

NOTE: The CODECs installed by FlexiSight do not support MP4 videos encoded with interlacing.

DV

DV, or raw digital video format, is an uncompressed video file format that is commonly used in consumer digital camcorders and professional recording equipment.

The advantages of this format are:

- Cross-platform format.
- Very easy to edit, cut and composite video.
- Can be converted to almost any distribution format such as DVD or DivX.

The disadvantages of this format are:

- File sizes are very large.
- Not suited for distribution.
- Editing software can be expensive and difficult to learn.

Editing DV

The DV format is widely supported on many consumer and professional non-linear digital video editing software. Below is a list of programs that support the editing of DV files:

- Apple iMovie HD 6 and iMovie 08 (Bundled with the iLife suite).
- Apple Final Cut Express and Final Cut Pro.
- Adobe Premiere Elements and Adobe Premiere Pro.
- Windows Movie Maker (Free with Windows XP).
- Windows DVD Maker (Free with Windows Vista).

NOTE: Editing DV files in non-linear editing programs is a complex process that is beyond the scope of this manual. The programs listed above are well documented and feature introductory tutorials. Please refer to these before you attempt to edit your video.

Converting to DV format

You can convert to DV format in two ways: analog or digital. To make an analog conversion you need video recording equipment with analog video inputs that has the ability to record to DV.

To make a digital conversion you need to copy your video files to you computer and use conversion software to create a DV version of your video file. Both Super C and ffmpegX can convert P350 video files to DV format.

NOTE: DV video files are up to 10 times the size of compressed video formats. Ensure you have sufficient hard-drive space before you attempt to convert to DV format.

Section 9 - Appendix

9.1 Getting help

The command module has a built in, context sensitive help screen. To access the help page, press **Fn + F1** simultaneously on the keypad or **Shift + F1** on the keyboard.

You can also view a list of keypad and keyboard shortcuts.
To see a list of shortcuts press **Fn + F2** simultaneously or press **Shift + F2** on the keyboard.

A list of shortcuts is included in Appendix 9.1.

9.2 Shortcuts

This appendix includes a list of keypad and keyboard shortcuts on the command module. Learning these can allow you to work more efficiently.

You can access a list of shortcuts by pressing both **FN + F2** on the keypad, or **SHIFT + F2** on the keyboard.

Appendix 9.1: Miscellaneous command and shortcuts

Keypad key		**Keyboard key**		**Description**
FN +	**F1**	**Shift +**	**F1**	Help (Shift key typically looks like an arrow: ⇧)
FN +	**F2**	**Shift +**	**F2**	List all shortcuts
FN +	**F4**	**Shift +**	**F4**	Software version
FN +	**F5**	**Shift +**	**F5**	Sonde ON/OFF
FN +	**F6**	**Shift +**	**F6**	Jump to top menu (when available)
			F9	Enter COUNTER value
		▲+ ▼	**F10**	Calibrate / ZERO the Counter
			H	Switch MIMIC ON / OFF
FN +	**▲**	**Ctrl+**	↑	Decrease drum rate of pull (manual mode only)
FN +	**▼**	**Ctrl +**	↓	Increase drum rate of pull (manual mode only)
			i	Toggle between drum and pushrod mode (only available when a pushrod has been selected in the past).

Appendix 9.2 Crawler commands and shortcuts

Keypad key		Keyboard key		Description
	▲			Drive Forward
	▼			Drive Backward
	◄			Steer left (P356 only)
	►			Steer right (P356 only)
				Motion STOP
		Ctrl +	C	
			SPACE BAR	
		Alt +	◄	Lock steer left
		Alt +	►	Lock steer right
		Ctrl +	◄	Trim left
		Ctrl +	►	Trim right
			M	Switch drive mode (MANUAL or AUTO)

Appendix 9.3 Camera commands and shortcuts

Keypad key		Keyboard key		Description
			F7	Light –
			F8	Light +
		Ctrl +	B	Iris close
		Ctrl +	D	Light switch
		Ctrl +	F	Pan reset
		Ctrl +	G	Pan right
		Ctrl +	H	Pan left
		Ctrl +	I	Rotate clockwise
		Ctrl +	J	Zoom reset
		Ctrl +	K	Zoom out
		Ctrl +	L	Zoom in
		Ctrl +	N	Iris open
		Ctrl +	O	Rotate anti-clockwise
		Ctrl +	T	Focus in
		Ctrl +	U	Rotate reset
		Ctrl +	Y	Focus out

			W	Target UP
			A	Target Left
			X	Target Down
			D	Target Right
			S	Go to Target
			J	PT camera Scan pipe joint
		Ctrl +	**Q**	Snapshot picture
		Ctrl+	**W**	Text Editor

9.3 Care, cleaning and maintenance

WARNING! Clean and sanitize the P350 flexitrax system with a suitable disinfectant at regular intervals to help prevent the risk of biological contaminations from foul water sources. Use appropriate gloves when cleaning the system.

Do not dismantle component parts, unless directed by this manual.

Terminals

CAUTION! Do not use damaged, dirty or corroded components, including all terminal connections, cables and O-rings. Do not grease, dampen or lubricate any connectors, as this will generally 'clog up' the spring pogo connectors and pads and is likely to cause electrical issues. Ensure that all terminals and connection points are clean and free of corrosion and debris before you attempt to use this equipment. Check that any O-rings are clean, greased and undamaged. Use a silicon-based grease such as "Super Lube" to lubricate o-rings. Pearpoint recommends protecting all terminals with plastic protection caps when the system is not in use. Only assemble or disassemble system components in a dry and clean environment.

CAUTION: On downhole equipment, a modified screw is used to ensure waterproof connections. It is critically important that only our official screws are used, our C-clamp screws are modified to ensure waterproof and reliable connection. Significant damage and costs will occur if "off-the-shelf" screws are used – which will not be covered by our warranty.

Cleaning the system

WARNING! Foul water systems can be a source of biological hazards; ensure you clean all equipment with a suitable disinfectant after use.

CAUTION: Do not use high-pressure hoses to clean this system. This could damage it.

Command Module

- Clean the case with mild soapy water.
- Use lint-free cloth to clean the LCD screen.

• The front I/O socket panel has a rain-proof water sealing flap. Make sure this is closed (protecting the I/O sockets) before allowing water anywhere near this area.

Crawler and Camera

- Clean with water and disinfectant
- Clean the lens with a lint-free cloth

Cable and drum

- Use a cloth moistened with disinfectant

Storing the system

The P350 is a precision tool. Always store the system, including all components and accessories, in a clean and dry environment.

9.4 Spare Parts List

10/P350-CMOD3 10/P350-CMOD3+	P350 Command Module; Compact Flash Card, Bluetooth Internal rechargeable battery version.	
10/P350-LOC-XX (US, UK, DE, FR, ES, IT, NL)	Localization packs: P350 flexitrax User Guide, Mains Cable (US or UK or EU), Flexisight CD (inc. License), P350 Keyboard (per country), Compact Flash Memory Card, P350 Visor Label (per country), USB Cable (A to B) 1m, Allen Key Set, Multi-purpose Grease 50ml	
10/P350-DRUM3-P-100 10/P350-DRUM3-P-150 10/P350-DRUM3-P-200 10/P350-DRUM3-P-250 10/P350-DRUM3-P-305	P350 Powered Drum, 100m; Command module support, Crank Handle 150m option. 200m option. 250m option. 305m option.	
10/P350-DRUM3-M-100-S 10/P350-DRUM3-M-150-S 10/P350-DRUM3-M-200-S 10/P350-DRUM3-M-250-S 10/P350-DRUM3-M-305-S	Manual Drum, 100m Swivel Terminated cable. Command Module Clamp, Crank Handle. MK3 connector version. 150m option. 200m option. 250m option. 305m option. Note: requires manual drum PSU	
10/P350-PSU3-M	P350 Manual Drum PSU Includes Manual Drum to PSU cable.	
10/P354	P354 Crawler (no steering)	
10/P356	P356 Crawler (Steerable)	
10/P350-WHEELS-S	Set of Small wheels, 4 hard tires, 4 soft tires.	

10/P350-WHEELS-M	Set of Medium wheels, 4 hard tires, 4 soft tires	
10/P350-WHEELS-L-MK2	Set of Large wheels with Tires (MK2 large wheel type).	
10/P350-DUAL-WHEEL-KIT	Dual-large wheel adaptors and 8 x large wheels for the P356 (enhanced surface area and traction)	
10/P350-WHEELS-M3-ADP-KIT	Set of adaptors to attach the P350 84mm wheels kit (P238 compatible wheels)	
10/P354-6R-S-ABR-KIT 10/P354-8R-M-ABR-KIT 10/P354-9R-M-ABR-KIT 10/P356-8R-M-ABR-KIT 10/P356-9R-M-ABR-KIT	P354 Abrasive Kit: 6" pipe kit P354 Abrasive Kit: 8" pipe kit P354 Abrasive Kit: 9" pipe kit P356 Abrasive Kit: 8" pipe kit P356 Abrasive Kit: 9" pipe kit	
10/P350-CAM-FW-PAL 10/P350-CAM-FW-NTSC	P350 Forward View Cameras	
10/P350-CAM-PT-PAL 10/P350-CAM-PT-NTSC	P350 Pan & Tilt Cameras	
10/P350-CAM-PTZ-PAL 10/P350-CAM-PTZ-NTSC	P350 Pan & Tilt with Zoom Cameras	

10/P350-PENDANT	P350 Pendant Controller	
10/P350-LH-8	8W Lighthead	
10/P350-ELV-F-MK2	P350 Fixed elevator (P354 up to 12", P356 up to 15") (P354 up to 300mm, P356 up to 380mm)	
10/P350-ELV-A	P350 Adjustable elevator (P354 up to 15", P356 up to 18") (P354 up to 380mm, P356 up to 458mm)	
10/P350-ELV-LAM	P350 Large elevator adjustable manual (P356 only 12" to 24") (P356 only 300mm to 600mm)	
10/P350-TIRES-HD-S	Set of Small (4) hard tires	
10/P350-TIRES-SF-S	Set of Small (4) soft tires	
10/P350-TIRES-HD-M	Set of Medium (4) hard tires	
10/P350-TIRES-SF-M	Set of Medium (4) soft tires	
10/P350-TIRES-L-MK2	Set of Large (4) tires (Pneumatics only)	

10/P350-ITUBES-MK2	Set of Large (4) inner tubes (for large pneumatic tyre only, do not fit the MK1 version large wheel)	
10/P350-LINK3-1 10/P350-LINK3-5 10/P350-LINK3-10	1m P350 Controller to PSU cable, MK3 connectors 5m option. 10m option.	
10/P350-LINK3-DRUM-PSU-1 10/P350-LINK3-DRUM-PSU-3 10/P350-LINK3-DRUM-PSU-10 10/P350-LINK3-DRUM-PSU-25 10/P350-LINK3-DRUM-PSU-50	1m Manual Drum-to-PSU cable MK3 3m option 10m option 25m option 50m option	
10/P350-LINK3-FLEXIPROBE-5 10/P350-LINK3-FLEXIPROBE-10 10/P350-LINK3-FLEXIPROBE-15 10/P350-LINK3-FLEXIPROBE-20 10/P350-LINK3-FLEXIPROBE-30	5m P350 Controller to Pushrod cable. MK3 10m option 15m option 20m option 30m option	
10/P350-LINK3-FLEXIPROBE-5 10/P350-LINK3-FLEXIPROBE-10 10/P350-LINK3-FLEXIPROBE-15 10/P350-LINK3-FLEXIPROBE-20 10/P350-LINK3-FLEXIPROBE-30	5m P350 PSU to Pushrod cable. MK3 10m option 15m option 20m option 30m option	
10/P354-DEP-TOOL 10/P356-DEP-TOOL	P354 crawler deployment tool (with Rods) P356 crawler deployment tool (with Rods)	
10/P350-ROD-SET	4 spare deployment Tool Rods (spares)	
10/P354-WEIGHT	P354 Crawler weight (enhances weight and grip in some situations).	

10/P350-DOWN-ROLL-MK2	P350 Down-hole rollers (Tiger Tail)	
10/P350-UP_ROLL	P350 Up-hole Roller (Manhole)	
10/P350-VEHICLE-FIX-KIT	P350 Power Drum Vehicle fixing Kit	
10/P350-WALL-KIT	P350 CMOD Wall mount Kit	
10/P350-CRANK-HANDLE	P350 Crank Handle	
10/P350-PDR	P350 Kit of 6 Power Drum Rollers	
10/P350-MAINS-US	US mains lead	
10/P350-MAINS-UK	UK mains lead	
10/P350-MAINS-EU	EU Mains lead	
10/P350-RTERM-KIT	P350 Re-termination Kit	
10/P350-STRL-KIT	P350 Strain Relief Kit	
10/P350-TERM-CLAMP	P350 Termination Clamp Kit with 5 screws	
10/P350-TERM-CLAMP-SCREW	P350 Bag of 5 off termination clamp screws	
10/P350-RETERM-UPGRADE	P350 Re-termination Upgrade (spare), strain relief assembly.	
10/P350-CONNECTOR-ORINGS	P350 10 Connector O-Rings (spare)	
10/P350-PT-O-RING-KIT	P350 PT Camera Customer O-Ring Set	
10/P350-PTZ-O-RING-KIT	P350 PTZ Camera Customer O-Ring Set	
10/P350-CAPS-KIT	P350 Set of 5 pairs of protective caps	
10/P350-TOW-EYE-CAP	P350 Cable blanking tow-eye	
10/P350-FRONT-CAP	P350 Front blanking cap	
26/RP3142S1	Compatible Compact Flash Card.	
26/RP3172S1	Compatible USB Memory drive	
10/P350-HEADSET	P350 Command Module Headset	
10/P350-KB-UK	P350 UK Keyboard	
10/P350-KB-US	P350 US Keyboard	
10/P350-KB-IT	P350 Italian Keyboard	
10/P350-KB-ES	P350 Spanish Keyboard	
10/P350-KB-DE	P350 German Keyboard	
10/P350-KB-FR	P350 French Keyboard	
10/P350-KB-NL	P350 Dutch Keyboard	
10/P350-ROD-PSU-EU	P350 EU Pushrod PSU and mains lead	
10/P350-ROD-PSU-UK	P350 UK Pushrod PSU and mains lead	
10/P350-ROD-PSU-USA_ROW	P350 USA and ROW Pushrod PSU American-style mains lead	

9.5 Crawler cable re-termination

The cable may be re-terminated if you suspect that video, power or communication signals are in anyway degraded. This may be indicated by poor video quality, intermittent power shortages or an unresponsive crawler.

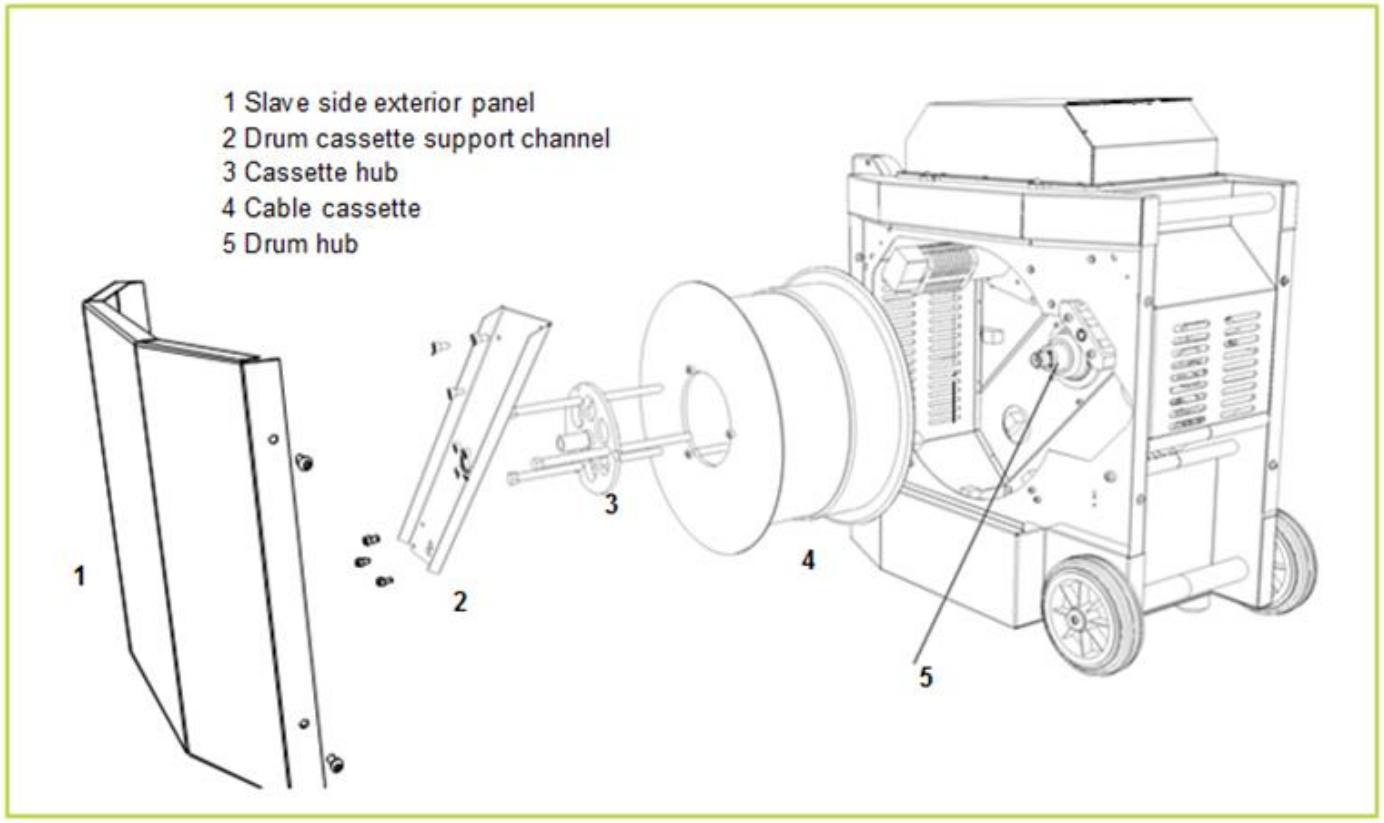
The *P350 flexitrax crawler cable re-termination guide* is available to download from the download section of the Radiodetection website: www.radiodetection.com.

This guide provides a detailed, step by step guide on how to re-terminate the crawler cable.

The cable re-termination procedure should only be performed by skilled and adequately trained technicians. For health and safety and product quality reasons.

9.6 Cable drum replacement

Appendix 9.4: Drum cassette replacement (exploded)



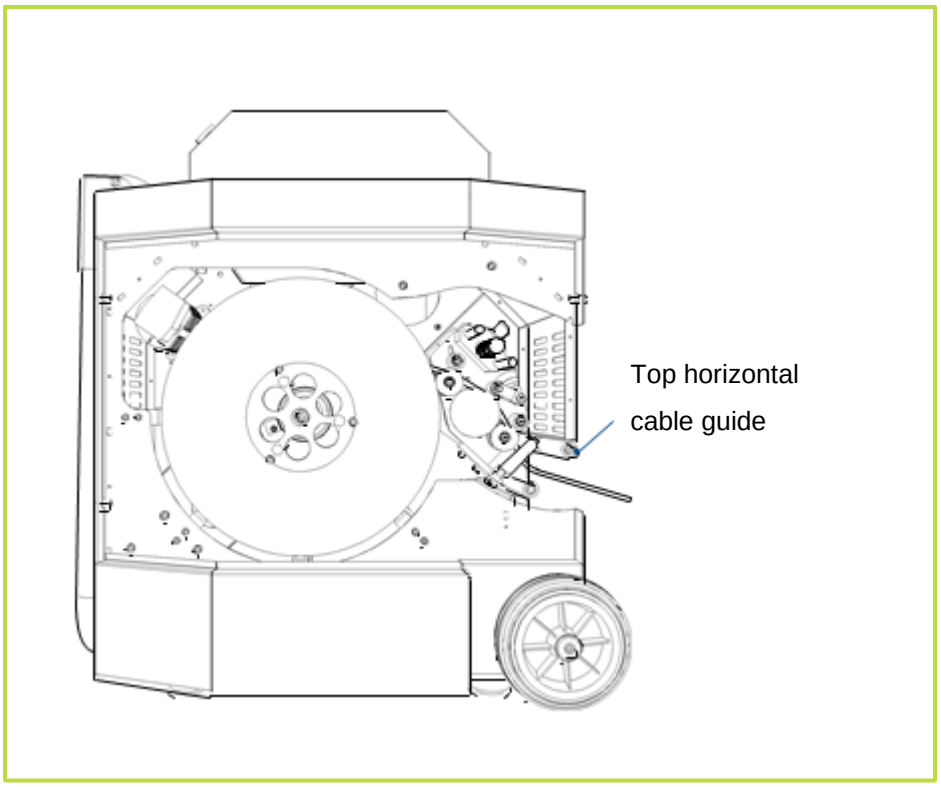
WARNING ! Switch the system off and disconnect the power lead and all other cables before you continue.

In the powered drum, the cable is housed in a cassette. This component is user-replaceable. The following procedure outlines the removal and replacement of the cable cassette.

Disassembly

1. Remove the slave-side panel
2. Remove the drum-cassette support channel
3. The drum cassette is held in place by the cassette hub. Do not remove this hub yet; proceed to the next step.
4. Remove the cable from the cable layering mechanism. To do so:
    a. Lift the spring loaded pinch roller to the upright position
    b. Unfasten the cable retaining rollers. The rollers are held in place by thumb screws on the reverse side of the cable layering mechanism.
5. Finally remove the top horizontal exterior cable guide.
6. Remove the cassette hub.
7. Disconnect the internal cassette cable connector from the drum hub.
8. You can now remove the cassette from the drum hub

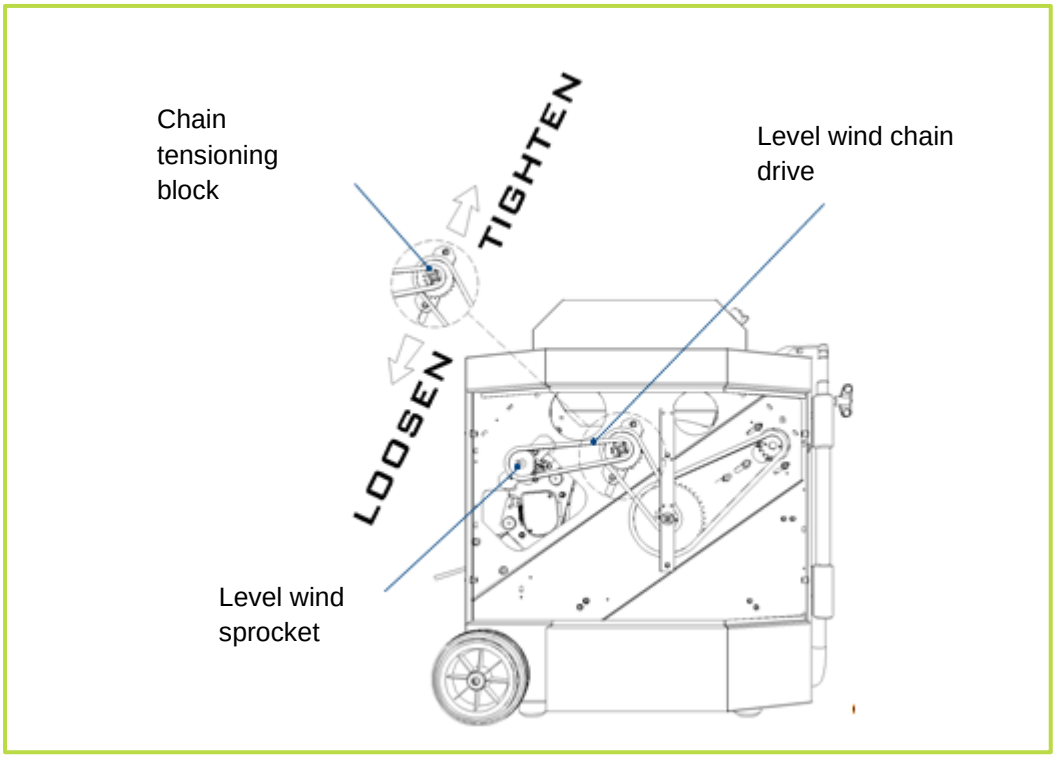
Appendix 9.5: Powered drum with slave side panel and drum support channel remove



Assembly

1. Replace the drum cassette as required.
2. Re-connect internal cassette connector to the drum hub
3. Secure the cassette hub.
4. Re-fit the drum cassette support channel.
5. Thread terminated cable through layering mechanism ensuring both cable retaining rollers (Figure 9.5) are returned to their 'locked' position and that the spring loaded pinch roller is in the down position.
6. Re-fit top horizontal cable guide (Figure 9.5).

Appendix 9.6: Adjusting the drive train



NOTE: Special care is required when threading the cable from the cable layering mechanism. You must correctly align the cable mechanism to match the cable's position on the drum otherwise the cable may become entangled. Proceed as described below.

The cable layering mechanism (Level Wind) features a leadscrew that allows the layering mechanism to move in two directions. When you retrieve the cable, this must be in-line with the follower (see Figure 9.7).

To synchronize the follower to the drive train and the cable, you may have to adjust the follower's position manually. To do so:

1. Slacken the 2-off internal M6x10 screws and move the chain tensioning block downwards (Figure 9.5).

2. Remove the level wind chain drive.

3. Adjust position of follower by turning the sprocket located at the leadscrew end so the follower is in-line with the cable exiting the drum cassette.

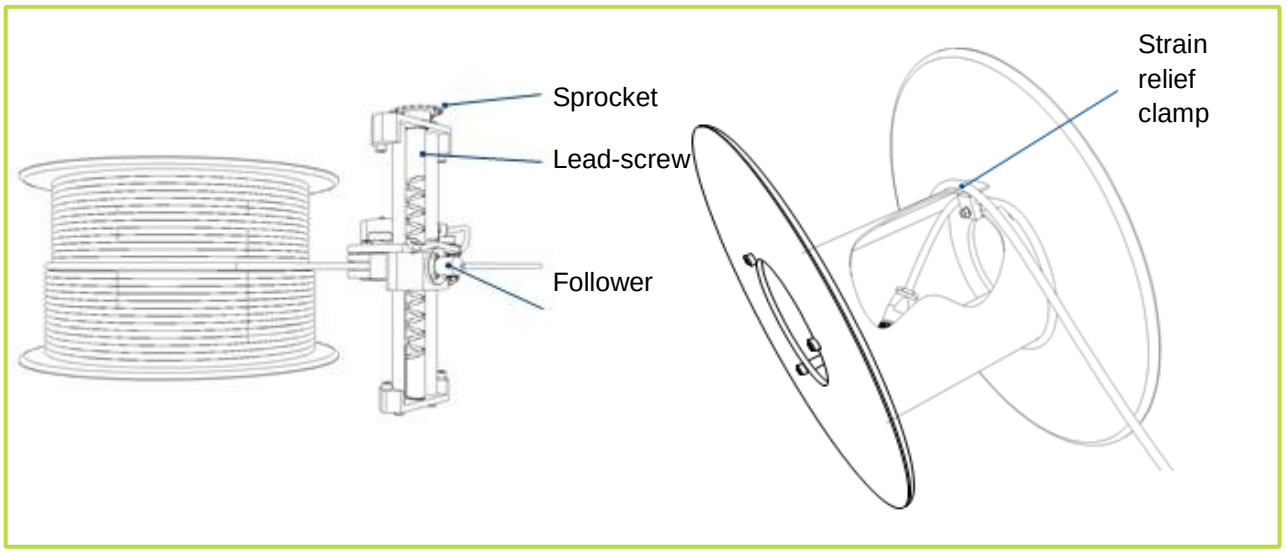
4. Re-fit the level wind chain drive. Manually pull the cable from the drum and ensure that the follower moves in the correct direction when the cable is spooling off the drum cassette. If this is not the case, remove the level wind chain again and manually rotate the level wind sprocket (maintaining the same direction) until the follower has gone right to the end of its travel and returned to the original position.

5. Re-attach the level wind chain drive, move the chain tensioning block upwards ensuring both chains are in tension prior to fully tightening the 2-off M6x10 screws.

6. Replace both the drive & slave side panels.

Appendix 9.7: Cable layering sprocket and follower (left)

Figure 9.8 Cable drum cassette (right)



Replacing cable

You can replace the cable in the cassette if required.

To do so (see Figure 9.4):

1. Disconnect the power and crawler from the system.

2. Pull the cable slowly out by hand.

3. Disassemble the system and remove the cable cassette following the guide in Section 9.4.

4. Remove the cassette's strain relief clamp and remove the remaining part of the cable end.

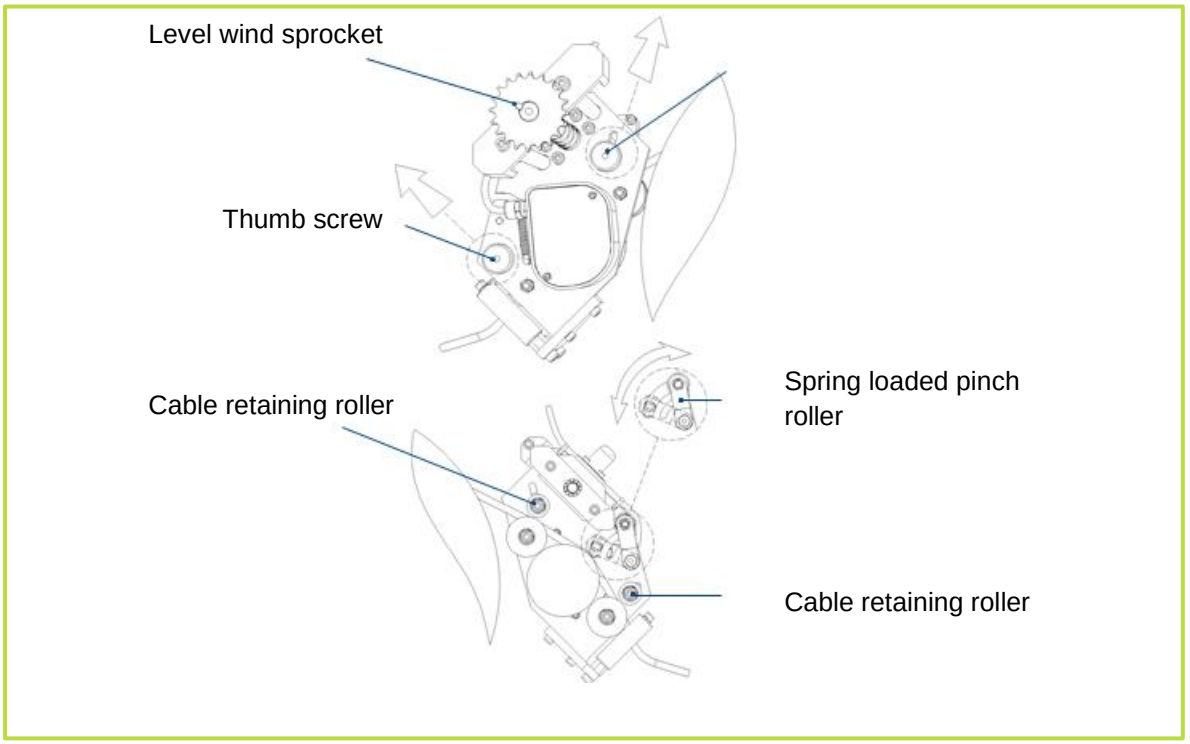
5. Insert new cable end into the drum; allow 500mm slack when you re-fit the cable to the strain relief clamp on the inside of the cassette.

6. Re-assemble the system using the procedure described in Section 9.4 ensuring the level wind follower (Figure 9.7) is in line with the entrance hole into the drum cassette.

7. Reconnect the power cable and switch on

8. Use manual drive mode to wind the cable back in to the drum.

Appendix 9.9



9.7 AVC Video license

Use of the images recorded with this equipment is permitted as supporting evidence of a professional survey or report. This product is licensed under the AVC Patent Portfolio License for the personal and non-commercial use of a consumer to (i) Encode video in compliance with the AVC standard ('AVC Video') and/or (ii) Decode AVC video that was encoded by a consumer engaged in a personal and non-commercial activity and/or was obtained from a video provider licensed to provide AVC video. No license is granted or shall be implied for any other use. Additional Information may be obtained from MPEG LA, L.L.C. See http://www.mpegla.com.

9.8 Specifications

Environmental specifications

Environmental* IP53 (Surface Equipment): IP68 to 110m/11bar (Downhole Equipment) with regular servicing.

(NOTE: IP53: Protection against sprayed water up to 60° from vertical)

Temperature (Storage): -20 to 80°C (-4 to 176°F). Temperature (Operating): -10 to 50°C (14 to 122°F).

*Unless otherwise stated.

Command module

Command module	**P350-CMOD3**
Screen	200mm / 8" Industrial TFT, SVGA
Storage	High Speed Compact Flash or Hi-Speed USB memory drive
Recording Time (hrs)*	1:45 (HQ) - 3:45 (MQ) - 9:00 (LQ)
Connectivity	USB 2.0, Video In/Out, Audio In/Out, Ethernet, Bluetooth®
Dimensions	300 x 360 x 200mm / 14" x 14" x 8"
Weight	P350 5.5kg /12lbs, P350+ 6.2kg / 13.5lbs.
P350+ Battery specification	14.8V, 6.6Ah (98Wh). Up to 4 hours recording when powered by the internal battery

*Based on a 2GB Compact Flash card

Cable Drums

Drums	P350-DRUM3-M	P350-DRUM3-P
Dimensions (L x W x H) Drum	445 x 270 x 570mm 17.5" x 10.6" x 22.4"	633 x 412 x 740mm 24.9" x 16.2" x 29.1"
Dimension (L x W x H) external Power Supply	418 x 195 x 420mm 16.5" x 7.7" x 16.5"	Integral
Weight external Power Supply	15.8kg	Integral
Weight Drum	18kg to 37kg / 39.7lbs to 64lbs depending on cable length	60kg to 75kg / 130lbs to 154lbs depending on cable length

Construction	Powder-coated tubular steel frame with steel and aluminum power pack enclosure. Stainless steel and aluminum manual cable management mechanism.	Powder-coated steel chassis with steel and aluminum enclosure. Interchangeable alloy cable drum. Stainless steel and aluminum automatic cable management mechanism

Manual Drum PSU & Powered Drum PSU

Power	110-240V, 50-60Hz, 1.2kVA. Generator (if used) to have inverter-type output.

Crawlers

Crawlers	P354	P356
Pipe diameter	100mm (4") to 300mm (12")	150mm (6") to 600mm (24")
Dimensions (L x W x H)	250mm (9.8") x 82mm (3.2") x 69mm (2.7")	345mm (13.6") x 128 (5") x 84 (3.3")
Weight	5.4kg (12lbs)	14kg (31lbs) approx.
Motors	1 x 50W	2 x 50W
Construction	Brass and Stainless Steel	Brass and Stainless Steel
Sonde frequency	512/ 640/ 8kHz /33kHz	512/ 640/ 8kHz / 33kHz
Inclinometer accuracy	± 0.2º when user calibrated	± 0.2º when user calibrated

*Minimum specified diameter must be maintained along the whole length of the survey

Cameras

Cameras	P350-CAM-FW	P350-CAM-PT	P350-CAM-PTZ
Dimensions (L x Diameter)	62 x 68mm / 2.4" x 2.7"	134 x 68mm / 5.3" x 2.7"	158 x 90mm / 6.2" x 3.5"
Weight	600g / 1.3lbs	1.8kg / 4.0lbs	2.9kg / 6.4lbs
Construction	Stainless Steel	Stainless steel and aluminium	Stainless steel and aluminium
Focal Range	10mm to ∞	10mm to ∞	10mm (WIDE) to ∞
Horizontal Resolution	≥ 460TVL	≥ 460TVL	≥460 TVL
Sensitivity	< 1.0 Lux	< 1.0 Lux	1.0 Lux @ f1.8
LED luminance	≥ 120lm	≥ 210lm	≥ 420lm

Auxiliary lighthead

Auxiliary lighthead	P350-LH-8
Dimension (L x Diameter)	63 x 136mm / 2.5” x 5.4”
Weight	1.8kg / 4.0lbs
Construction	Stainless Steel and Aluminum
LED Luminance	≥ 850lm

Elevators

Elevators	P350-ELV-F-MK2 (Fixed Elevator)	P350-ELV-A (Adjustable Elevator)	P350-ELV-LAM (Large Manual Elevator)
Weight	0.7kg / 1.5lbs	0.7kg / 1.5lbs	4.5kg / 9.9lbs
Construction	Stainless Steel and Aluminum	Stainless Steel	Stainless Steel and Aluminum
Pipe Range (P354)	Up to 300mm / 12”	Up to 380mm / 15”	Not available
Pipe Range (P356)	up to 380mm / 15”	up to 458mm / 18”	300mm to 600mm 12” to 24”

Pendant Controller

Pendant Controller	P350-PENDANT
Dimension (L x Diameter)	250 x 80 x 40mm / 9.8” x 3.1” x 1.6”
Weight	0.7kg / 1.5lbs
Construction	Linear Medium Density Polyethylene (LMDPE) and mild steel
IP Rating	IP64

Product Approvals

Safety:

• EN 61010-1

• IEC 61010-1

• UL 61010-1

EMC:

• EN 61326-2-1 (Class A Emissions / Basic Immunity)

P350 flexitrax system

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SPX®
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Global locations

USA

SPX Global Headquarters
13515 Ballantyne Corporate Place
Charlotte, NC 28277, USA
Tel: +1 704 752 4400
www.spx.com

Radiodetection
28 Tower Road, Raymond, Maine 04071, USA
Tel: +1 (207) 655 8525
Toll Free: +1 (877) 247 3797
Fax: +1 (207) 655 8535
rd.sales.us@spx.com
www.radiodetection.com

Pearpoint
39-740 Garand Lane, Unit B
Palm Desert, CA 92211, USA
Tel: +1 800 688 8094
Tel: +1 760 343 7350
Fax: +1 760 343 7351
pearpoint.sales.us@spx.com
www.radiodetection.com

Radiodetection (Canada)
344 Edgeley Boulevard, Unit 34
Concord, Ontario L4K 4B7, Canada
Tel: +1 (905) 660 9995
Toll Free: +1 (800) 665 7953
Fax: +1 (905) 660 9579
rd.sales.ca@spx.com
www.radiodetection.com

EUROPE

Radiodetection Ltd. (UK)
Western Drive, Bristol BS14 0AF, UK
Tel: +44 (0) 117 976 7776
Fax: +44 (0) 117 976 7775
rd.sales.uk@spx.com
www.radiodetection.com

Radiodetection (France)
13 Grande Rue, 76220, Neuf Marché, France
Tel: +33 (0) 2 32 89 93 60
Fax: +33 (0) 2 35 90 95 58
rd.sales.fr@spx.com
http://fr.radiodetection.com

Radiodetection (Benelux)
Industriestraat 11
7041 GD 's-Heerenberg, Netherlands
Tel: +31 (0) 314 66 47 00
Fax: +31 (0) 314 66 41 30
rd.sales.nl@spx.com
http://nl.radiodetection.com

Radiodetection (Germany)
Groendahlscher Weg 118
46446 Emmerich am Rhein, Germany
Tel: +49 (0) 28 51 92 37 20
Fax: +49 (0) 28 51 92 37 520
rd.sales.de@spx.com
http://de.radiodetection.com

ASIA-PACIFIC

Radiodetection (Asia-Pacific)
Room 708, CC Wu Building
302-308 Hennessy Road, Wan Chai
Hong Kong SAR, China
Tel: +852 2110 8160
Fax: +852 2110 9681
rd.sales.asiapacific@spx.com
www.radiodetection.com

Radiodetection (China)
Room 5-10, Workshop 4
No. 10 Zhenggezhuang Village
Beiqijia Town, Changping District
Beijing 102209, China
Tel: +86 (0) 10 8178 5652
Fax: +86 (0) 10 8178 5662
rd.service.cn@spx.com
http://cn.radiodetection.com

Radiodetection (Australia)
Unit H1, 101 Rookwood Road,
Yagoona NSW 2199, Australia
Tel: +61 (0) 2 9707 3222
Fax: +61 (0) 2 9707 3788
rd.sales.au@spx.com
www.radiodetection.com

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